























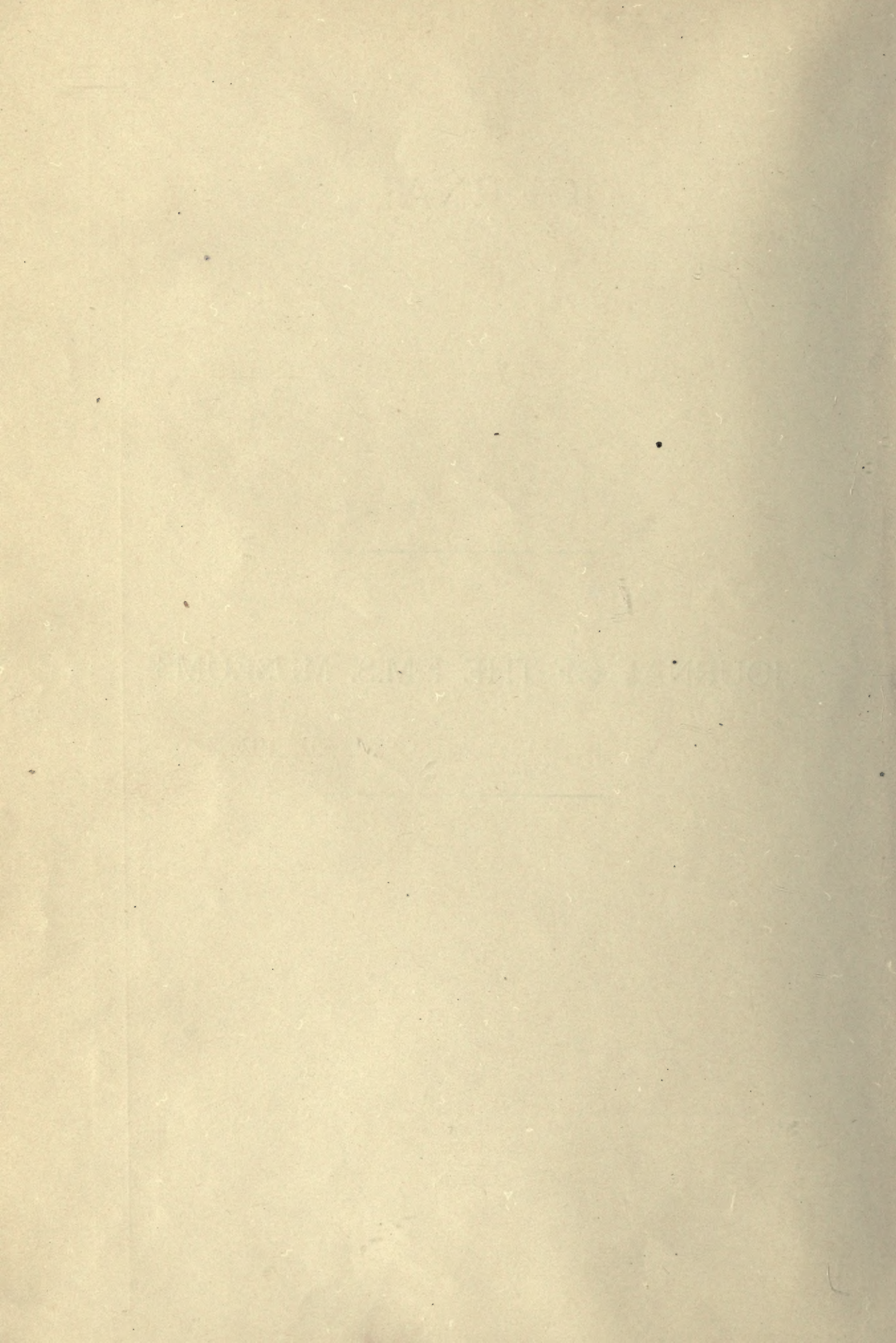


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JOURNAL OF THE F.M.S. MUSEUMS.

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Malay States, Federated. Museums

# JOURNAL

OF THE

Federated Malay States Museums.

Vol. X

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#### PART I.

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# I. ON SEA SNAKES FROM THE COASTS OF THE MALAY PENINSULA, SIAM AND COCHIN-CHINA.

By MALCOLM A. SMITH, F.Z.S.

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## INTRODUCTION.

This paper is based upon collections made during the past seven years. The total number of specimens examined amounts to nearly 900. In addition to those obtained in or near the Gulf of Siam, I have been permitted to study, through the courtesy of the Director of the F.M.S. Museums, several fine collections made in the Straits of Malacca, chiefly off the coast of Perak. I have thus been able to compare large series of several different species from two entirely different localities, and the results have been of great interest.

Most of the specimens have been obtained by native collectors, working in conjunction with the fisher people. Nearly all have been caught at river mouths, where the water is slightly brackish, either by visiting the fishing stakes set a short distance out to sea, at the time of the daily haul, or by obtaining them from the nets or baskets placed within the river mouth. The collections from Pulau Angsa, off the coast of Selangor, from Bangnara, Patani, from Hua Hin, and a small one made at the head of the Gulf of Siam are exceptions to this. They were made in purely salt water, the snakes being caught while trawling, or in an ordinary hand net as they lay on the surface of the water.

Other means than the above of obtaining sea snakes are less productive. Some species are attracted by a light at night, and can be speared or netted. *Enhydris hardwickii* I have often known caught on a hook and line; and a certain number are to be found left on the beach by the receding tide.



Sea snakes can be conveyed long distances alive if attention is paid to their method of transport. They are best kept in a jar or basket and, if not overcrowded and placed in a cool spot with enough water to keep them moist, they will lie almost motionless and live for a week or more. In water they are continually on the move, jostling and disturbing one another. The advantage of obtaining fresh specimens, and of being able to prepare them one's self is considerable, and adds greatly to their value for study purposes.

Out of their native habitat sea snakes are helpless and usually extremely sluggish and unaggressive. Although I have examined many hundreds of them alive, I have never seen one make any attempt to bite except under great provocation. The fishermen in the Gulf, although well aware of the dangerous nature of their bite, have little dread of them, and those that happen to get into their boats with the fish, are picked up by the tail and flung back into the water.

Judging by the numbers of sea snakes that can be seen in the Gulf of Siam and Straits of Malacca when travelling by steamer along the ordinary trade route, it is possible that many new and interesting forms will be found by deep sea collecting. In certain localities, when the sea is calm, they may often be seen in hundreds, chiefly in the early morning and late afternoon, as they lie on the surface of the water, apparently to bask in the sun. As soon as they feel the wash of the steamer, they dive almost vertically downwards and disappear.

At the head of the Gulf where the coast is well sheltered, sea snakes abound; farther down the Peninsula, where it is exposed to the full force of the N. E. monsoon, they appear to be less numerous. Two sheltered spots are an exception to this, namely, the mouth of the Inland Sea, Singgora, and the Bay of Patani.

By systematically collecting at every available spot, it has been possible in course of time to search the whole of the Gulf very thoroughly. The result of this has been to bring out one noteworthy fact, namely, the curiously local distribution of many of the species. Certain forms will be more or less abundant along a small stretch of coast, at one or more river mouths, and almost or entirely absent in other parts of the Gulf. The Perak coast collections shew this same peculiarity, but as they have been made over a much smaller coast line, it is not so marked. It is difficult to assign a reason for this phenomenon. The natural conditions at the mouths of these rivers, generally mud-flats, are apparently identical, so that it would not in any way appear to be governed by the food requirements of these species. It may be that they are estuarine in their habits, and that when they get carried out to sea, as must frequently happen, they perish, either from want of suitable nourishment, or by being devoured by fish or other enemies.



Some good collections made well away from the coast would be of value in helping to elucidate this interesting problem.

This eccentricity of distribution, as well as minor variations in scalation and colour which I have found confined to certain localities only, confirms the view that I have held for some time, namely, that although the range of a species may be very great, that of the individuals comprising it is inclined to be extremely local.

It follows from this that we may expect to find among sea snakes a considerable number of geographical forms. No attempt has yet been made to define races for any of the species, for the reason that few herpetologists have had sufficient material to work upon. Yet it is clear, when a good series can be obtained from one locality, and compared with a series from another, sufficiently remote, that differences can be found. In many cases the difference is not great, and is confined merely to slight variation in the number of scales round the neck and body. A few shew more distinct changes, not only in the number of scale rows but in the relationship of the head shields to one another. Owing to the wide variation which the individuals of a species may exhibit in any one locality, large series are naturally required before the range of variation of any particular race can be defined. It is imperative also, if satisfactory results are to be obtained, that the same methods of examination should be used. For, according to the way in which the scale rows and ventral shields are counted, so will the results differ.

In counting the body scales I have endeavoured to find the minimum and the maximum number of rows. This necessitates several counts at each spot. The minimum is upon the neck, usually from two to three, but sometimes as much as from four to five, heads-lengths behind the head. The maximum is at mid-body or posterior to it. In certain forms, such as *Enhydris*, *Thalassophis*, *Hydrus*, the maximum is usually attained by mid-body, but in most of them, and particularly in the small headed forms, it is not reached until well past mid-body. The ventrals are counted from the first bituberculated shield that can be discovered upon the neck, and all missing ones are allowed for as if they were present.

The range in the number of ventral shields varies considerably. It is greatest in that group of species which are at present defined under "head very small, body very long and slender anteriorly." It will be seen however, upon inspection of the tables given, that while the range of the majority in a series is comparatively limited, a few individuals at either end string it out and add greatly to its number. It is disturbing, after having examined a large series, and obtained what appears to be the range of variation of these shields, to find another example which upsets one's figures to the extent of twenty, thirty, or even more. Some specimens in my collection differ in this respect so



markedly from what appears to be the normal, that I have refrained for the present from making any diagnosis of them. A good illustration of this anomaly will be found under *Hydrophis viperina*, a snake possessing so many unique features that there can be no doubt of its identity.

The measurements of length given are in many cases approximate only. It is impossible with a specimen coiled up and hardened by alcohol to be exact. Where total lengths are concerned a slight discrepancy is of little importance, but in connection with the sexual variation in the length of the tail, it is of considerable value.

A full list of all the specimens examined has not been given in every case. In dealing with large numbers of a common form this has seemed unnecessary. In other instances the specimens had been given away to various Museums before a register of them was undertaken.

The following places are mentioned as having been collected in :—

#### IN THE GULF OF SIAM.

*Meklong* or *Meklawng*, *Tachin*, *Bangpakong*, *Chantabun*, *Ban Yao*,—fishing villages at the mouths of the rivers of those names at the head of the Gulf. A reference such as *Chantabun* implies the mouth of the *Chantabun* river, not *Chantabun* town.

*Koh Kong*, a small island off the coast of Cambodia, just beyond Siamese territory.

*Hua Hin*, a fishing village on the west side of the Gulf, 80 km. south of the mouth of the *Meklawng* river, the nearest fresh water to this village being at

*Pran*, 20 km. south.

*Chumpon*, *Langsuan*, *Bandon*, *Singgora*, on the east coast of the peninsular portion of Siam.

*Bangnara* in *Patani*, and *Trengganu*, on the east coast of the Malay Peninsula.

#### IN THE STRAITS OF MALACCA.

*Kuala Kurau*, *Kuala Larut*, *Londang*, on the coast of *Perak*.

*Bagan Datoh*, in the estuary of the *Perak* river.

*Pulau Angsa*, 8 km. off the coast of *Selangor*, a purely salt water islet.

*Bernam River*, *Selangor*.

*Trang*, 120 km. south of the island of *Puket* (*Junk Seylon*).

#### IN COCHIN CHINA.

*Cap St. Jacques*, at the mouth of the *Saigon* river.

Preliminary diagnoses of *Hydrophis lamberti*, *H. siamensis*, *H. consobrinus* and *H. rostralis* appeared in the *Journal of the Natural History Society of Siam*, ii, p. 340 (1917). Further study of these forms in the light of additional specimens obtained since that date, have obliged me to modify considerably the remarks I made at that time. The



types of all the species here described will be presented to the British Museum of Natural History, together with a selection from the type series.

In the preparation of this paper I have, above all, to thank Mr. G. A. Boulenger, F.R.S., for the generous help by correspondence which he has so freely given me at all times.

I have to thank also Mr. H. C. Robinson, Director of F.M.S. Museums, and Mr. C. Boden Kloss, for the valuable collections made under their direction, and sent to me from time to time.

I am indebted also to Dr. Nelson Annandale of the Indian Museum, to Messrs. N. B. Kinnear and W. S. Millard of the Bombay Natural History Society, and Dr. Hanitsch of the Raffles Museum, Singapore, for the loan of specimens in their charge on various occasions.

Mr. C. L. Groundwater I have to thank for his careful drawings of the heads of snakes, and Mr. J. R. Bell for the map.

#### *Hydrus platurus* (Linn.).

Boulenger, Cat. Sn. B. M., II, p. 267 (1896) ; idem, Fauna Malay Pen., Rept. and Batr. p. 181 (1912) ; Stejneger, Herpet. Japan, p. 439 (1907) ; Wall, Mem. Asiat. Soc. Bengal, II (8), p. 248 (1909) ; idem, Journ. Bombay N.H.S., XXVI, p. 808 (1919) ; Barbour, Mem. Mus. Comp. Zool. Harvard, XLIV, p. 129 (Nov. 1912) ; N. de Rooij, Rept. Ind. Aust. Archipel., II, p. 224 (1917).

*Pelamydrus platurus*, Stej., Proc. U. S. N. Mus., 38, p. 111, (May, 1910).

Gulf of Siam, 20 exs. ; Straits of Malacca, 9 exs.

This snake appears to be a strictly marine species. All the specimens referred to above were taken in purely salt water. The Gulf series was caught with a dip net while lying on the surface of the water, and was taken one morning while off the coast between Hua Hin and Koh Lak. Altogether some 50 individuals were seen. With the exception of a few specimens of the common *Enhydris hardwickii*, they were the only snakes noticed. Although I spent the succeeding week in cruising down the same coast, going as far South as Lat. 9° (Bandon) for the express purpose of collecting sea snakes, I did not meet afterwards with more than half a dozen snakes of any kind. The weather conditions were the same throughout.

*Colouration*.—(Gulf series). Black above, yellow to dark brown on the sides and below, the two colours meeting in a clear line of demarcation. Tail with black dorsal and ventral bars ; sometimes with a few spots as well. Upper lip the same colour as the sides of the body.

Some of the darker examples have a yellow stripe separating the black of the back from the brown of the under parts. The amount of black upon the back is variable in width, occupying from 11 to 18 scales, but in no instance is it narrow enough to deserve the name of vertebral band. All of this series belongs to Boulenger's vars. D and E, and they are merely variations of the same



colour form (*bicolor*), the yellow merging by every degree of intensity into brown.

(Straits of Malacca series). Two out of the nine examples obtained (Nos. 3903, 3915) are coloured as above, but the remaining seven are quite different. They have a narrowish black dorsal band occupying about ten scales, while the rest of the body is yellow, thickly spotted with black. In the fore-part of the body the upper spots have coalesced to form a narrow stripe, so that there is alternately a dorsal band, a narrow yellow stripe, and then a black one. The dorsal band in the hinder part of the body is sinuous in outline or is broken into large spots. Tail thickly spotted, with the central or ventral part entirely black. In some examples the whole head is dark brown or black.

I regard these as Boulenger's form B (Jan's *maculata*). They shew no tendency whatever to intergrade with the previous form.

In addition to the difference in colour, the Straits series shews a higher average number of scale rows round the neck and body, than those from the Gulf. The variation is as follows :—

#### GULF OF SIAM.

39 to 50 round the neck ; 48 to 60 round the body.

#### STRAITS OF MALACCA.

44 to 55 round the neck ; 52 to 68 round the body.

The question of racial distinction in this widely distributed snake is a complex one. Boulenger describes seven colour varieties, but does not attempt to connect them in any way with geographical areas. Barbour, with the additional material available in the Harvard College Museum says "nine easily distinguishable color phases may be recognized." Six of these, he adds, occur in and about the Bay of Panama.

I do not think he has sufficiently proved that his *Hydrus platurus ornatus* is entitled to subspecific rank. Its habitat he defines as the East Indian Archipelago, and his own specimen (No. 938) came from Singapore. But, as shewn by my two series, we may expect to find in the same locality at least three other colour forms, namely, Boulenger's B. D. and E.

#### *Hydrophis lamberti* Smith.

Journ. N. H. S. Siam, ii, p. 340 (1917).

*Description of the type.*—Head rather large, neck thick, body moderately elongate. Eye a little larger than its distance from the mouth ; rostral considerably broader than deep, the portion visible above equal to one-third the length of the internasal suture ; frontal once and a half as long as broad, much shorter than its distance from the



rostral ; one prae- and two postoculars ; two superposed anterior temporals ; eight supralabials, the 2nd in contact with the prae- and two postoculars ; three or four infralabials in contact with the anterior chin-shields ; no distinct posterior pair. 45 scales round the neck, 55 round the thickest part of the body, \* those anterior feebly imbricate, elongate, with truncated apex, and feebly keeled, those posterior, hexagonal and subimbricate, with a short central keel ; ventrals distinct throughout, 281, bicarinate ; subcaudals, 43.

Pale yellowish-grey above, whitish below, with 30 dark dorsal rhombs on the body, tapering to a point on the sides ; tail with 4 bars and a dark tip. Head above pale olivaceous.

*Dimensions.*—Total length, 860 ; tail, 80, depth of neck, 18 ; of body, 42 mm.

*Dentition.*—Posterior maxillary, 10 ; palatine, 10 ; pterygoid, 23 or 24 ; mandibular, 22, (1 specimen examined).

*Type.*—Female, author's number, 1112. Collected at the mouth of the Meklawng river, Inner Gulf of Siam, in Sept., 1916.

*Variation.*—By fragmentation of the upper extremity of the 3rd supralabial on one side, it is prevented from touching the eye. There are no small scales interposed between the infralabials.

A second specimen of this snake, No. 4010, a juvenile, total length 335 mm., differs from the type in the following particulars :—Portion of rostral visible above equal to nearly half the length of the internasal suture ; 7 upper labials ; posterior chin-shields small, separated by four scales ; 302 ventrals ; 38 dark dorsal rhombs.

It was collected at Hua Hin, near the type locality by Mr. S. G. Lambert, after whom I have much pleasure in naming it.

This snake is closely allied to *H. ornatus* (Gray) from which it differs chiefly in the greater number of scale rows round the neck and body.

***Hydrophis godeffroyi* Peters.**

*Hydrophis godeffroyi*, Peters, Mon. Berl. Ac., 1872, p. 856, p. 1, fig. 3.

*Distira godeffroyi*, Boulenger, Cat. Sn. B. M., III, p. 291 (1896).

*Disteira godeffroyi*, Stejneger, Herpet. Japan, p. 430 (1907).

*Distira ornata*, Wall, Mem. As. Soc. Bengal, II, (8), p. 234 (1909).

Cap St. Jacques, 2 exs.

I have referred these specimens to *H. godeffroyi* as they agree very well, both with Boulenger's description of this

\* 35 and 45 scale rows, as given in my preliminary diagnosis, is an error, and is herewith corrected.



species in the Catalogue, and with Stejneger's description of his type from Ishigaki Shima.\*

Wall has placed *godeffroyi* under *ornatus*, and in this he may be right. The only reliable character separating these two species appears to be the number of scales round the neck and body, *godeffroyi* having fewer. On the other hand, the only reliable character upon which I can separate my *lamberti* from *ornatus* is also upon the number of scale rows, *lamberti* having more. It is possible that *ornatus* is a very variable species, but it is hardly likely that the range would be so great in one locality. I have never yet seen any specimens of *ornatus* from the Gulf, although they have been recorded, but until I can fill in the large gap which separates my specimens of *lamberti* from *godeffroyi*, I leave all three as they stand. The accompanying table will shew the differences between them.

*Variation*.—The internasal suture is three times as long as the interpraefrontal in one of my specimens, only once and a half times as long in the other. Three postoculars on one side, two on the other, in each example. Two superposed anterior temporals, the lower one again broken into two by a vertical suture. Seven supralabials in one, eight in the other, the third and fourth touching the eye. Chin-shields subequal, the posterior pair, and also partly the anterior pair, separated by scales. Four infralabials in contact with the chin-shields.

Boulenger states that the scales on the posterior part of the body are juxtaposed. I should term mine feebly imbricate; they are certainly not juxtaposed as the word is meant when applied to such species as *H. gracilis* or *Enhydris hardwickii*.

*Colour*.—Buffy-white, with 58 and 68 darkish grey dorsal bars upon the body and tail. Head greyish-olive above, white below.

*Dentition*.—Posterior maxillary, 12 or 13; palatine, 8; pterygoid, 25 to 27; mandibular, 20, (2 specimens examined).

#### *Hydrophis cyanocinctus* Daudin.

*Hydrophis cyanocinctus*, Bouleng., Cat. Sn., B. M., III, p. 294 (1896); idem. Fauna Malay Pen., Rept. and Batr., p. 185 (1912); Wall, Journ. Bombay N. H. S., XXIII, p. 375 (1914), and XXVI, p. 433 (1919); N. de Rooij, Rept. Ind. Aust. Archipel., II, p. 237 (1917).

*Disteira cyanocincta*, Stej. Herpet. Japan, p. 428 (1907).

*Distira cyanocinta*, Wall, (part.), Mem. Asiat. Soc. Bengal, II, (8) p. 217 (1909).

40 specimens. Straits of Malacca, 11 ♂, 6 ♀; Gulf of Siam, 6 ♂, 7 ♀; Cap St. Jacques, Cochin China, 6 ♂, 4 ♀.

\* I mention type because the tabulated list of the other three specimens given is somewhat confusing. The type has 34 scales round the neck and 43 round the body, an increase of 9. But the next two examples have an increase of only 5 and 1 respectively, while the last has none at all, the count for this individual being 33 for both neck and body. It looks like a misprint, but I have no means of knowing.



I have recently examined the type of *H. tuberculata* Anders., in the Indian Museum, and am in agreement with Wall (Monograph, p. 220) that it should be placed under *cyanocinctus*. It has 31 and 41 scale rows and 312 ventrals.

My largest specimen, a female from the mouth of the Tachin river, is considerably bigger than any previously recorded. It measures 1885 mm. in total length, tail 135.

Considering that the type *H. aspera* Günther, is said to have come from Singapore, a noteworthy feature about most of the specimens is the absence of strong keeling to the scales. The majority are quite smooth in the anterior portion of the body, faintly keeled on the dorsal rows in the posterior part. One example only, a well grown male, is very strongly keeled; on the other hand, another male, half grown, is entirely smooth throughout.

The eye is variable in size but in all the adults is less than its distance to the mouth. In two examples, Nos. 1315, 1318, it is extremely small.

The anterior temporal shields shew considerable variation. Normally there are two, placed one above the other, the suture between them being horizontal. But the suture may be obliquely placed, or even almost vertical, so that the two shields, instead of being superposed, are placed one behind the other. Cuneiform scales between the infralabials are present in all, usually a series after the second.

In the number of scales round the neck and body, the specimens from the Straits of Malacca shew a slightly higher variation than those from the Gulf of Siam. How far they differ, if at all, from the Indian form (type locality Bengal), can only be determined when more exact data from that region are available.

The variation (including 10 embryos), is as follows :—

29 to 35, usually 31 to 33, round the neck.

39 to 47, \* usually 41 to 43, round the body.

Ventrals 292 to 377.

Excluding the embryos, the frontal shield is shorter than its distance to the rostral in 3 examples, equal to its distance in 10, greater than in 1. The posterior chin shields are in contact with each other in 4 examples, partly separated in 12, completely separated in 1.

Compared with these specimens, the series from the coasts of Siam and Cochin China shews a slight reduction in the number of scale rows, although in other characters, except possibly in the size of the frontal, it presents no differences. It is as follows :—

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\* Wall records a specimen with 49 scales at the thickest part of the body, but does not say from where it has come. Journ. N. H. S. Bombay, XXVI, p. 436 (1919).



28 to 33, usually 29 to 31, scales round the neck.

37 to 43, usually 39 to 43, round the body.

Ventrals, 321 to 389.

The frontal shield is as long as its distance to the rostral in 11 examples, longer than in 12, in 9 of these being as long as its distance to the end of the snout. The posterior chin shields are in contact with each other in 12 examples, partly separated in 11.

*Colour*.—All the young ones taken from the mother referred to below, belong to Boulenger's Var. A of the Catalogue. They are light olivaceous yellow, with from 65 to 80 blackish annuli, broadest on the back and joined together by a strong black stripe running along the belly. Head black, with or without a curved yellow band across the snout behind the nostril, and continued back along the sides of the head. Posterior half of tail, black.

A comparison of these juveniles with the other more grown individuals in the series, shows that the ventral part of the stripe and ventral band gradually disappear with age. In some of the younger specimens, one-quarter and one-third grown, these markings can still be traced, but in the adults they are entirely lost. All of these are best placed under C and D, but between the two no dividing line can be drawn. From the handsome individuals with bold, black or blue-black dorsal bars, to those in which the bars are so obscurely marked as to be hardly recognizable, every gradation can be seen. Head olivaceous or yellowish, sometimes mottled with blackish.

The adult form with complete jet black annuli and ventral stripe which is to be found along the Coasts of India, and which appears to turn up again in the seas around Formosa I have never seen in this region.

*Dentition*.—Posterior maxillary, 6 or 7; palatine, 7 or 8; pterygoid, 15 to 19; mandibular, 15 or 16, (7 specimens examined).

*Breeding*.—One pregnant female with 10 fully developed young was caught in May off the Coast of Perak.

*Mother*.—Total length 1690 mm.; 31 scales round the neck, 42 round the body, ventrals 337.

*Young*.—Total length, 360 to 380 mm.; 29 to 31 scales round the neck, 39 to 41 round the body. The ventrals could not be counted satisfactorily.

Two other gravid females with their embryos still in an early stage of development were obtained in January and May in the Gulf of Siam. Their broods were 5 and 11 respectively.

 *Hydrophis melanosoma* Günther.

*Hydrophis melanosoma*, Günther, Rept. Brit. Ind., p. 367, pl. XXV (1864).

*Distira melanosoma*, Blgr., Cat. Sn. B. M., III, p. 291 (1896).

*Distira wrayi*, Blgr., Ann. and Mag. Nat. Hist., (7) V, p. 307, (1900).

*Distira spiralis* (part), Wall, Mem. Asiat. Soc. Bengal, II (8), p. 212 (1909).

*Hydrophis wrayi*, Blgr., Fauna Malay Pen., Rept. and Batr., p. 185 (1912).

15 exs., Kuala Kurau, Coast of Perak.

All the differences between *H. wrayi* Blgr., and *H. melanosoma* Günth., being disposed of by the above series, Mr. Boulenger is in agreement with me that his species should become a synonym of Günther's. The type of *H. wrayi* is from the coast of Perak. The type locality of *H. melanosoma* is unknown. Both forms were described from single examples.

On the whole my series is a very uniform lot, and shews remarkably little variation. The eye in the adult is always shorter than its distance to the mouth; the frontal is as long as its distance to the rostral in two examples, shorter than in thirteen; four infralabials are in contact with the chin-shields, which are subequal in size; the posterior pair are in contact in one example, partly separated in eight, completely separated in six. Seven supralabials and a single anterior temporal occur in every example.

Boulenger has described the body scales of his specimen as "feebly imbricate," while Gunther uses "distinctly imbricate" for his. I should use the latter expression for my specimens. Those on the neck and anterior part of the body are longer than broad, with obtusely pointed extremities, those on the posterior part are more rounded, and as broad as or broader than, long. The strength of the keeling is variable and differs with age. Ventrals distinct throughout, bicarinate. Fragmentation of the fourth and fifth supralabials occurs in two examples. In one the frontals and praefrontals are fused, and in another the sixth and seventh supralabials are fused on one side. In no instance do the praefrontals fail to touch the supralabials. A small cuneiform scale is usually present after the second and third infralabials.

*Colour.*—Greenish yellow, the dorsal scales with black margins, and with 50 to 70 broad black bands, usually as broad above as below, and about twice as broad as their interspaces. Some of them are incomplete ventrally. Head black, uniform or with a yellowish mottling which is chiefly confined to the snout.

In two examples, Nos. 1121 and 1122, the bands narrow ventrally, so that upon the belly they are about as broad as their interspaces. Judging from my specimens, the colouration of this snake does not appear to undergo much alteration with age.

*Dentition.*—Posterior maxillary, 5 or 6; palatine, 7; pterygoid, 11 or 12; mandibular, 14 (2 specimens examined).

Wall, in his Monograph, places both *melanosoma* and *wrayi* under *spiralis* (*brugmansi*), and writing again quite recently (Journ. Bombay Nat. Hist. Soc., XXVI, p. 431, May,



1919), is still of the same opinion. With a different scale formula however, more strongly imbricate body scales, and distinctive colouration (practically a *brugmansii* reversed), there seems every reason to keep these species separate.

I do not understand his remark upon the following page (footnote, Journ. p. 433), where he also contends that *melanosoma* may have to be placed under *cyanocinctus*.

#### *Hydrophis brugmansii* Boie.

*Hydrophis brugmansii*, Bouleng., Cat. Sn. B. M., p. 292 (1896) ; idem. Faun. Malay Pen., Rept. and Batr., p. 184 (1912) ; Wall, Journ. Bombay N. H. S., XXIII, p. 375 (1914) ; N. de Rooij, Rept. Ind. Aust. Archipel., II, p. 233 (1917).

*Distira spiralis*, Wall, Mem. Asiat. Soc. Bengal, II, (8) p. 208 (1909).

*Hydrophis spiralis*, Wall, Journ. Bombay N.H.S., XXVI, p. 430 (1919).

The natural habitat of this species appears to be the coasts of India, whence individuals occasionally reach the shores of the Malay Peninsula. Cantor obtained a specimen at Penang and I have examined two more from the coast of Perak.

They agree entirely with Boulenger's description. The scales round the body are smooth anteriorly, and have a feeble keel posteriorly. The ventrals are smooth throughout. One specimen (No. 1202) has no cunieform scales between the infralabials, an unusual condition in this species.

*Colour*.—Greenish-yellow above, the dorsal scales with black margins, yellowish or whitish below. 44 and 45 narrow black bands upon the body, the bands slightly enlarged dorsally and ventrally in one, very indistinct across the belly in the other. Head yellowish, posterior half of tail black.

*Dentition*.—Posterior maxillary, 7 ; palatine, 7 ; pterygoid, 13 ; mandibular, 16 (1 specimen examined).

Under *brugmansii* (*spiralis*), Wall has included some eight or nine other forms, which as far as I am aware are still considered distinct by other herpetologists. Only two of them are concerned with this paper, namely *melanosoma* and *wrayi*, and these I have dealt with in discussing the former.

#### *Hydrophis torquatus* Günther.

Under *torquatus* I now include three forms which I have previously considered distinct. No other species of sea snake that I have yet examined shews such distinct changes, both in scalation and in colouration, within so small an area. That variation should occur between series found upon the opposing sides of the Peninsula, was to be expected, but that two distinct forms should occur in the Gulf of Siam, with only 350 miles of open sea between them, was surprising. With a large series of each form however,

available for examination, I find that they intergrade so completely with each other, that it seems impossible to distinguish between them. The three forms are :—

*HYDROPHIS TORQUATUS TORQUATUS.*

33—37 scales round the neck ; 43—49 round the body.  
Ventrals 242—306.

Head in the adult pale grey, with a considerable suffusion of yellow on the top.

Habitat. Coast of Perak and Selangor.

*HYDROPHIS TORQUATUS AAGAARDI.*

32—37 scales round the neck ; 39—47 round the body.  
Ventrals 276—325.

Head in the adult dark olive to blackish, with a curved yellow mark across the snout and along the sides.

Habitat. Coast of Patani, Gulf of Siam.

*HYDROPHIS TORQUATUS SIAMENSIS.*

29—35 scales round the neck ; 35—42 round the body.  
Ventrals 271—343.

Colouration as in *aagaardi*.

Habitat. Inner Gulf of Siam.

*Hydrophis torquatus torquatus.*

*Hydrophis torquatus*, Günther, Rept. Brit. Ind., p. 369, pl. XXV, fig. H, (1864) ; Boulenger, Fauna Malay Pen., Rept. and Batr., p. 190 (1912) ; N. de Rooij, Rept. Ind. Aust. Archipel., II, p. 231 (1917).

*Distira torquata*, Wall (part.), Mem. Asiat. Soc. Bengal, II, (8), p. 229 (1909).

Coast of Perak, 39 exs. ; Bernam River, Selangor, 2 exs.

Günther's types came from Penang, so that my Perak coast specimens are, for all practical purposes, topotypes. On the whole they are a very uniform lot, and shew more constancy in scalation than the other two forms found in the Gulf.

*Variation.*—The frontal shield, except in one instance, is always shorter than its distance to the rostral. The supralabials normally are seven, the first four being usually complete, the fifth divided, and the last two (rarely are there three), very small. Chin-shields well developed, the posterior pair in contact with each other or partly separated by a scale. Four infralabials in contact with the chin-shields ; cuneiform scales invariably present between the infralabials, usually a series after the second.

33—37 scales round the neck, 43—49 round the body, those anterior elongate, with truncate or bluntly pointed apex, those posterior more or less hexagonal, imbricate or subimbricate throughout, with a central tubercle or short keel. Ventrals distinct throughout, 242—306. Average 277. The number next to 242 is 260.

In adult specimens the depth of the body posteriorly is from 2 to  $2\frac{1}{2}$  times that of the neck.



**Colour.**—This varies considerably with age. The young are whitish, with from 46 to 63 well defined black bands, which are often incomplete ventrally. Head black, with a whitish or yellowish mark across the snout and along the sides. Adults are pale grey above, yellowish white below, with darker grey bands, less clearly defined, and usually incomplete ventrally in the posterior part of the body. In some aged individuals the bands have almost entirely disappeared, leaving the back more or less uniform grey. Head grey, with the yellow marks more extensive and less defined, this latter colour sometimes covering the whole of the top of the head except a small patch on the crown.

**Length.**—One example measures 835 mm. in total length, but the majority of the specimens are under 700 mm.

**Dentition.**—Posterior maxillary, 8 to 10, palatine, 7—8; pterygoid, 19 to 22; mandibular, 16—18 (14 specimens examined).

Wall, in his Monograph, has included under *torquatus* another snake which Boulenger now recognises as *diadema*, (the *obscurus* of the Catalogue, p. 284). His argument for combining these two species does not convince me, and the points of difference upon which he states Boulenger has separated them, do not appear to me to be the correct ones. The difference in the number of scales round the neck and body, and the marked difference in the number of ventrals, have been overlooked by him entirely.

That these two species cannot be identical is well shewn by my series, which, as already stated, is topotypical. In the number of scales round the neck and body, and in the number of ventrals, they agree very closely with Günther's description.

*Hydrophis torquatus aagaardi*, subsp. nov.

Similar to *H. t. torquatus*, but with average fewer number of scale rows round the body, greater average number of ventrals, larger frontal, and darker colouration.

**Type.**—Adult male, author's number, 1169, collected July 1917, off the coast of Bangnara, Patani, Gulf of Siam, by Mr. C. J. Aagaard.

Number of specimens examined, 44, all from the type locality.

**Variation.**—The frontal shield in this form is very variable both in size and shape. In 26 examples it is as long as its distance to the rostral, in 7 examples it is shorter than, and in 9 it is longer than, its distance from that shield. In No. 1267 it is considerably shorter than its distance to the rostral, in No. 1273 it is as long as its distance to the end of the snout, yet there can be no doubt that these two represent the same species. Two postoculars occur in one example. As with the typical form, the temporal shield is very constant, a single scale being present in every instance. The supralabials however are more subject to division in *aagaardi*, and fragmentation may occur in any of them after the second.

32—37, usually 33—35, scales round the neck, 39—47, usually 42—45, round the body. Ventrals 276—325. Average 297.

*Colour.*—Greyish or greenish-grey above, yellowish white below, with from 55—68 dark grey or blackish annuli, which may be incomplete ventrally. Head black to dark olive, with a yellow band across the snout and continued back along the sides of the head. Sometimes a few yellow spots on the frontal and parietal shields. With age all the markings lose definition, but both this form and the succeeding one are more prone to keep their markings in adult life than the typical form.

*H. t. aagaardi* represents a race intermediate between *H. t. typica* and *H. t. siamensis*, resembling more the former in scalation and the latter in colour. But for the discovery of this form, I should still have regarded *H. t. siamensis* as a species distinct from *H. t. typica*.

All the specimens were taken in deep clear sea water, being caught in trawling nets, some as far as 20 miles from the coast. I have much pleasure in naming this subspecies after Mr. C. J. Aagaard, of the Bangnara Rubber Estate, Patani, to whom I am indebted for so fine a series.

Two other specimens, Nos. 1276, 1175, taken off the same coast and in company with typical specimens of *H. t. aagaardi*, must be mentioned here. They have 34 and 37 scales round the neck, and 43 and 51 round the body respectively. Ventrals 302 and 292. Both are females and both have two superposed temporal shields on both sides. In other respects they agree entirely with *H. t. aagaardi*.

No. 1276, with 43 scale rows I should have referred without much hesitation to this form, for the same variation in the temporal shields is to be found in its northern ally *H. t. siamensis*. No. 1175, with 51 scale rows—no, less than 4 in excess of what is to be found in any other specimen of my series—is not so easily disposed of. For the present I regard them both as aberrant examples of *H. t. aagaardi*.

#### *Hydrophis torquatus siamensis* Smith.

*Hydrophis tuberculatus*, Smith, Journ. N. H. S. Siam, I, pp. 214, 247 (1915).

*Hydrophis siamensis*, Smith, J. N. H. S. Siam, II, p. 341 (1917) ; idem, Journ. Bombay N. H. S., XXVI, p. 682 (1919).

Similar to *H. t. torquatus*, but with fewer scale rows round the neck and body, greater average number of ventrals, larger average frontal and darker colour ; also in a tendency of the temporal shield to subdivision.

*Type.*—Adult male, author's number 1151, collected at Ban Yao, Inner Gulf of Siam, Sept., 1917.

Number of specimens examined, 84.

*Variation.*—The frontal shield is as long as its distance to the rostral in about 50% of the specimens ; in the remainder it is shorter, with two exceptions, in which it is nearly as long as its distance to the end of the snout. The



temporal shield is not so constant as in the other two forms, in some examples having undergone fragmentation into 2, 3 or 4 pieces. It is noteworthy however, that this irregularity is almost entirely confined to the individuals of one locality. Of my 84 specimens, division of this shield on one or both sides occurs in 16, of which 14 are from the mouth of the Chantabun river.

In 7 embryos extracted from their mother, a single shield is present in 5, while in the remaining 2 it is divided. The mother has one shield on one side, two on the other.

The supralabial shields are subject to the same irregularity as in *aagaardi*.

29—34, usually 31—33, scales round the neck, 35—42, usually 37—39, round the body. Ventrals 271—343. Average 300. (Chantabun, E. coast series, 296; Meklong, W. coast series, 306).

In the actual increase in the number of scale rows round the body, as compared with that round the neck, this form differs from both the preceding ones. In *siamensis* the body count is from 5—9, usually 6—8, more than the neck, whereas in the other two it is from 6—11, usually 8—10.

*Colour*.—As in *aagaardi*, except that the yellow upon the head is inclined to be more diffuse. In a few examples it is in excess of the ground colour. Most of the specimens are completely banded. Two individuals, Nos. 1279, 1298, have the head and back almost entirely uniform darkish grey; other examples are characterized by a broad irregular ventral band, either broken or continuous.

*Distribution*.—From Meklong on the Western side of the Gulf to Koh Chang on the East. It is particularly abundant at the mouths of the Meklong and Chantabun rivers.

*Dimensions*.—As will be seen from a study of the annexed tables, the two forms in the Gulf appear to grow to a larger size than that found in the typical locality.

Specimens of this snake which I sent to the Museum of the Bombay Natural History Society, have been diagnosed by Col. Wall as *Hydrophis cyanocinctus*. My reasons for dissenting from his opinion have already been given in the Journal of that Society (l.c.s.), and his reply to my criticisms later (p. 864) do not in any way influence my previous conclusions.

The tables of *H. t. siamensis* and *H. cyanocinctus* which I have given here should be sufficient to shew that the variation in the number of scale rows in these two forms is not the same. Nor can his other remarks with regard to scalation, size and colouration, in view of the large series now available for examination, be maintained. As I have already remarked, the two snakes when compared side by side—however much they may be alike on paper—are to me so different, that I am surprised that Col. Wall should ever have thought them identical.

*Breeding.*—Young are born in February and March. Two females are of interest, as shewing the difference in the size of the embryos due to nutrition. The parents are of equal length 925 mm.—but while one contained a brood of 8, the other had only 3. Both broods are apparently fully developed. The average length of the family of 8 is 285 mm., that of the other 325.

To this race I refer the specimen recorded by Flower from the Gulf of Siam (P.Z.S., 1899, p. 687, No. 190) as *Hydrophis obscurus* (now *diadema*). I count it to have 32 and 38 scale rows, with 302 ventrals and 10 posterior maxillary teeth. It is I believe the only record of *diadema* from the Gulf.

*Hydrophis caerulescens* (Shaw).

*Hydrophis caerulescens*, Bouleng., Cat. Sn. B. M., p. 275 (1896) ; idem, Fauna Malay Pen., Rept. and Batr., p. 187 (1912) ; Wall, Journ. N. H. S. Bombay, xxiii, pp. 373/374 (1914).

*Distira caerulescens*, Wall, Mem. Asiat. Soc. Bengal, ii, (8), p. 231 (1909).

This snake has a wide distribution, and from Bombay to Cochin China appears to be found almost everywhere along the Asiatic coast. Curiously enough it has not yet been recorded from the Malay Archipelago.

With its large number of strongly keeled scales round the neck and body, it is well differentiated from most others, and has not been subject to much confusion in the past.

Boulenger's conception of this species, as regards the number of scales round the neck and body, is without doubt too restricted. Wall, working on more material, found the variation to be considerably greater. He was dealing however, chiefly with Indian specimens. With the large series before me now (98 examples), from the coasts of Siam and the Malay Peninsula, the range can be still further increased. Between the most extreme forms, such as one from Orissa (No. 14493, Indian Museum), with 43 scales round the neck, and 51 round the body, and another of mine (No. 1352) from the Gulf of Siam, with 31 round the neck and 38 round the body, the difference is so great that they might be considered distinct, were it not that the gradation between them can be easily traced.

I have only been able to examine a small series from the Indian coasts, and between them and examples from the Straits of Malacca I can find no marked difference. Those from the Indian coasts have a slightly higher average number of scale rows, and a larger series might shew this character to be constant, the maximum average number of scale rows obtaining in that region. Wall also has pointed out that this sea snake possesses a character which is almost peculiarly its own, namely, that the parietal shield nearly always fails to touch the postocular. His observation, derived chiefly from Indian specimens, applies equally well to my series from the Straits of Malacca<sup>1</sup>.

<sup>1</sup> As shewn later, this character is absent in *H. caerulescens thai*. I have found it present also, as an abnormality, in *H. klossi* and *H. consobrinus*.



I therefore group all these together under *forma caerulescens* (type locality, Vizagapatam).

HYDROPHIS CAERULESCENS CAERULESCENS.

33 to 43 scales round the neck, 42 to 53<sup>1</sup> round the body ; ventrals, 253 to 337 ; parietals usually not in contact with the postocular.

*Colour*.—Greyish above, yellowish-white below, with from 40 to 60 dark bands which may be incomplete ventrally. The young have the bands very clearly defined, but with age the markings lose definition, and in some adults are scarcely recognizable, the back being almost uniform grey. Head blackish in the young, darkish grey in the adult, sometimes with a light streak behind the eye<sup>2</sup>.

*Habitat*.—Shores of India and Burma and west coast of the Malay Peninsula.

Number of specimens examined, 65. Coast of India, 9 ; Mergui Archipelago, 2 ; Straits of Malacca, 54.

The actual variation between my series from the Indian coast and the Straits of Malacca is as follows :—

India. 35 to 43 scales round the neck, 45 to 51 round the body ; ventrals, 269 to 332.

Straits of Malacca. 33 to 42 (usually 37 to 39) scales round the neck ; 45 to 51 (usually 45 to 48) round the body ; ventrals, 253 to 319 (average, 290).

*Variation*.—The frontal shield in 11 examples is as long as its distance from the rostral. In 3 examples the posterior chin-shields are absent. The parietal shield touches the postocular on both sides in 3 examples only, and on 1 side in 7 more.

Specimens from the Gulf of Siam I distinguish as

*Hydrophis caerulescens thai*<sup>3</sup>, subsp. nov.

Differs from the typical form in having fewer scale rows round the neck and body, and in the parietals usually being in contact with the postocular.

31 to 38 (usually 33 to 36) scales round the neck, 38 to 49 (usually 41 to 45) round the body ; ventrals, 262 to 334.

*Colour*.—The dark bands upon the body, although not so conspicuous in adults as in juveniles, do not shew that tendency to become entirely lost with advancing age as in the preceding form.

*Habitat*.—Coasts of Siam and Cochin China.

Number of specimens examined, 42 (Gulf of Siam, 40, Cap St. Jacques, 2).

*Type*.—Adult male, author's number, 1353, collected at Hua Hin, Gulf of Siam, in June 1917.

<sup>1</sup> 53 is recorded by Wall (Monograph).

<sup>2</sup> The presence of this streak is not mentioned by any author, although Günther very clearly figures it. It occurs in about 30% of my specimens.

<sup>3</sup> Thai = Siamese, pronounced tai,

**Variation.**—The frontal in 15 examples is as long as its distance from the rostral; in one it is longer than its distance; in no examples are the chin shields absent; in two instances the posterior pair are in contact with each other; the parietal shield fails to touch the postocular in two examples only on both sides, and in one example more on one side. Average ventral count, 291.

**Dentition.**—*H. caerulea* has an unusually large number of teeth in the maxillary bone behind the poison fangs. I find the dentition as follows:—Posterior maxillary, 13 to 16; palatine, 7 or 8; pterygoid, 21 to 23; mandibular, 21 to 25 (7 specimens examined).

***Hydrophis klossi* Boulenger.**

*Hydrophis klossi*, Boulenger, Fauna Malay Pen., Rept. and Batr., p. 190 (1912); Smith, Journ. Bombay N. H. S., xxiii, p. 787 (1915).

35 exs., Straits of Malacca, 13 ♂, 5 ♀; Gulf of Siam, 10 ♂, 7 ♀.

Boulenger's description was drawn up from a single specimen, but with the large amount of material now available this can be considerably augmented, and it will be simpler to redescribe the species than to add a number of points to his original remarks.

**Description.**—Head small, body long and slender anteriorly, the posterior depth in the adult being from  $2\frac{1}{2}$  to 3 times that of the neck. Snout distinctly projecting beyond the lower jaw; eye equal to or slightly less than its distance from the mouth. Rostral as broad as deep, or broader than deep, the portion visible above equal to from  $\frac{1}{3}$  to  $\frac{2}{3}$  the internasal suture; frontal small, longer than broad, usually shorter than its distance from the rostral; one pre- and one postocular; one large anterior temporal; usually five supralabials, 3rd and 4th touching the eye, sometimes a small sixth; two pairs of chin-shields, subequal in size, the posterior pair partly or completely separated; four infralabials in contact with the chin-shields.

23 to 27 scales round the neck, 31 to 39 round the body, imbricate throughout, the anterior ones elongate with bluntly pointed extremities, smooth or faintly keeled, the posterior ones broader with more rounded extremities and more strongly keeled. Ventrals distinct throughout, 360 to 402.

Greyish or greenish above, yellowish or whitish below, with from 50 to 75 dark bands. In the fore part of the body these are as broad above as below and slightly broader than their interspaces, behind usually twice as broad above as below. In some the bands are incomplete ventrally, and in some they are linked up by a black line running along the ventral shields; or the lower part of the neck may be entirely black. Head blackish to olivaceous, lighter on the snout, sometimes with an indistinct horse-shoe shaped mark, its front across the prefrontals and the ends upon the temporal shields. The young at birth are white, with



clearly defined black bands. Head entirely black, or with a yellow spot behind each nostril, or with the horse-shoe mark; with age the bands become less distinct but are always clearly recognizable.

*Dentition*.—Posterior maxillary, 5 or 6; palatine, 7; pterygoid, 9 or 10; mandibular, 13 or 14 (4 specimens examined).

*Variation*.—The frontal shield is very variable as regards size, but except in one example is always shorter than its distance from the rostral; in one example only it is nearly as small as in the type. One example has the 4th supralabial touching the eye on one side, and the 3rd, 4th and 5th on the other. Fragmentation of the upper labials, and cuneiform scales among the lower are rare, the former condition occurs in two examples, the latter in one.

*H. klossi* with its uniform rows of imbricate scales, appears to be closely allied to *H. nigrocinctus* Daudin, from the Indian seas, and *H. melanocephalus* Gray from the Riu Kiu Islands. In the number of scales round the body these three forms are much alike, but *klossi* has more ventrals, a smaller frontal and fewer supralabials. *Nigrocinctus* also has two anterior temporals.

As will be seen by inspection of the accompanying tables, the Siamese form has a slightly higher average number of scale rows than the Malaccan form. The variation is as follows:—

#### STRAITS OF MALACCA, *forma typica*.

23—25 scales round the neck; 31—35 round the body. Ventrals, 361—386 (av. 372).

#### GULF OF SIAM.

23—27 scales round the neck; 33—39 round the body. Ventrals, 360—386 (av. 372).

*Breeding*.—In the Gulf this occurs in March, from 2 to 5 young being produced. Females taken off the coast of Perak in September, shewed the embryos well advanced in development.

#### *Hydrophis consobrinus* Smith.

Journ. Nat. Hist. Soc. Siam, II, p. 341 (1917).

*Diagnosis*.—Posterior maxillary teeth, 5. Head very small, body very long and slender anteriorly; 25 to 31 scales round the neck, 36 to 45 round the body; ventrals, 328 to 401. A single anterior temporal. Head with a curved yellow mark above.

*Description*.—Head very small, body very long and slender anteriorly, its greatest depth in the adult being from two and a half to three times that of the neck. Eye slightly greater than its distance from the mouth; rostral broader than deep, visible above; frontal once and one third to once and a half times longer than broad, as long as or slightly shorter than its distance to the rostral; one

prae- and one, rarely two, postoculars ; a single large anterior temporal succeeded by another not so large, and with 4 to 7, usually 5 or 6, small scales in a series between them and behind the parietals. Six supralabials, 2nd largest and in contact with the prae-frontal, 3rd and 4th touching the eye, 6th very small. Chin-shields well developed, subequal, the posterior pair in contact or partly separated. Four infralabials in contact with the chin-shields.

25 to 31 scales round the neck, 36 to 45 round the thickest part of the body, those on the neck imbricate, clongate, with truncated apex, those posterior hexagonal, subimbricate, with a small tubercle or short keel. Ventrals distinct throughout, bicarinate, 328 to 401.

*Colour.*—Greyish above, yellowish or whitish below, with dark grey bars or bands, 60 to 80 in number. In the fore-part of the body these bands are as broad above as below, and broader than their interspaces ; behind broadest on the back, narrowing on the sides, and usually incomplete across the belly. Head blackish or greyish, with a curved yellow mark, its front on the nostrils, and reaching back along the sides of the head. Often a connecting bar across the frontal and another across the parietal shields. With age these markings lose definition.

*Variation.*—The frontal shield touches the nasals in one example ; the anterior temporal by fusion with the 6th supralabial sometimes reaches the border of the mouth ; fission of the 2nd supralabial in one example produces a pseudo-loreal (No. 2216) ; marginal fragmentation of the supralabials is not present in any example ; usually there is a single cuneiform scale after the third infralabial.

*Dentition.*—Posterior maxillary, 5 ; palatine, 7 ; pterygoid, 15 or 16 ; mandibular, 13 or 14 (3 specimens examined).

*Type.*—Adult male, author's number, 1132 ; collected at the mouth of the Bangpakong river, Inner Gulf of Siam, in February, 1917.

*Habitat.*—Coasts of the Malay Peninsula, Siam and Cochin China.

*Remarks.*—*H. consobrinus* appears to be most nearly related to *H. brookii* Günther, and *H. floweri* Boulenger, two species described from the north coast of Borneo ; and it is not unlikely that it will ultimately have to be united with one or other of them. Neither, however, accord entirely with the scalation presented by my large series of *consobrinus*, and until more is known about the variation existing in these two forms, I leave mine distinct.

With the true status of this snake therefore still uncertain, I refrain from describing geographical races, although the form found in the Straits of Malacca is quite distinct from that found in the Gulf. The case is further complicated by the three examples from Cap St. Jacques, which



also differ from the Gulf series, but shew a tendency to revert back towards the Malaccan form. The variation is as follows :—

#### GULF OF SIAM.

25 to 27 scales round the neck. 37 to 41 round the body. Ventrals, 358 to 401. Av. 377.

Number of specimens examined, 18. The frontal is as long as its distance from the rostral in 17, shorter than in one.

#### STRAITS OF MALACCA.

27, usually 29 to 31, scales round the neck. 39 to 45, usually 41 to 43, round the body. Ventrals 328 to 396. Av. 367.

Number of specimens examined, 50. The frontal shield is as long as its distance from the rostral in 33 examples, shorter than in the remainder.

#### CAP ST. JACQUES.

29 to 30 scales round the neck. 41 to 43 round the body. Ventrals, 387 to 400.

The frontal shield is longer than its distance to the rostral in one example, equal to in two.

With the typical form of *fasciatus* as I now conceive it, this species should not be confused, but from *atriceps*, with its lower scale formula, separation may at times be difficult. The yellow head markings of *consobrinus* are, however, very consistent, and in fresh specimens an almost infallible guide. A small but very useful differential character in scalation between them is also to be found in the scales behind the parietal shields. In *atriceps* there are usually three small scales lying in a series between the large posterior temporal shields and behind the parietals. Rarely there are four or two. *Consobrinus* on the other hand has usually five or six in the series, sometimes four, rarely seven, their number depending upon the size of the posterior temporal shields. As in *atriceps*, the posterior temporal shield of *consobrinus* may be divided by a vertical suture into two.

*H. klossi*, which in the Gulf has often the same number of scale rows on the body as *consobrinus*, can be distinguished by its distinctly imbricate scales, fewer supralabials and proportionately larger head of olivaceous colour.

*Breeding*.—A gravid female taken off the coast of Perak in December contained 7 embryos in an early stage of development. Another taken in February contained 5 fully developed young, varying from 330 to 340 mm. in length. The mother measured 880 mm., tail 70.

*Hydrophis fasciatus* (Schneider).

*Aturia lindsayi*, Gray, Zool. Misc. p. 61 (1842).

*Hydrophis fasciatus*, Boulenger, Cat. Sn. B. M., III, p. 281 (1896) ; idem, Fauna Malay Pen., Rept. and Batr., p. 189 (1912) ; N. de Rooij, Rept. Ind. Aust. Archipel., II, p. 230 (1917).

*Hydrophis leptodira*, Boulenger, Cat. Sn. B. M., p. 285.

*Hydrophis rhombifer*, Boulenger, Fauna Malay Pen., p. 188.

*Distira fasciata* (part.), Wall, Mem. Asiat. Soc. Bengal, II (8), p. 205 (1909).

*Hydrophis fasciatus* as it is known at present, is said to be distributed from the coasts of India to China and New Guinea. The evidence for its existence in the Far East is somewhat obscure, and it will be as well to discuss the specimens which have contributed to the statement before proceeding further.

*Hydrophis lindsayi* (Gray). The type and only known specimen is in the British Museum. It has 31 and 48 scales round the neck and body respectively, and 452 ventrals<sup>1</sup>. Its habitat, China, is vague, and Mr. Boulenger tells me he does not attach much importance to it.

*H. fasciatus* has been recorded by Boettger from Manila, and also from Miyakoshima, Riu Kiu (Loo Choo) Ids. The former specimen has been placed by Van Denburgh and Thompson under their *Disteira cincinnatii*<sup>2</sup> but, as I shall presently endeavour to shew, their snake agrees so closely with the form of *fasciatus* which is found in the Gulf of Siam, that I think they should be united.

Stejneger has referred the Japanese example to *Disteira melanocephala*,<sup>3</sup> but presumably has not examined it. He is probably right in doing so, but its scale formula is so near to that given by Van Denburgh and Thompson for some of their Manila specimens, that in the light of present knowledge it might be as well to reserve opinion.

Stejneger's suggestion that *melanocephala* may ultimately prove to be only a race of *fasciatus* (p. 421), is not in my opinion borne out by the example he has kindly sent me. With its imbricate scales, those on the posterior part of the body having more rounded edges rather than the regular hexagons of *fasciatus*, with its 7 or 8 supralabials, and 7 posterior maxillary teeth, I believe it to be quite distinct. *Fasciatus* has only 5 teeth behind the poison fangs, and this number appears to be constant.

*Hydrophis atriceps* Günther. The type is from the Gulf of Siam, and it has 28 and 44 scales round the neck and body respectively, and 364 ventrals. Such a scale combination is very typical of the form which is found in the Gulf, and differs distinctly from the one which inhabits the Straits of Malacca, and apparently also the entire Sea of Bengal. The difference is so marked that it is entitled to subspecific distinction, and in choosing a name for it one cannot do better than revive Günther's.

<sup>1</sup> For the scale formulae of *H. lindsayi*, *H. atriceps*, and Cantor's specimen of *H. fasciatus* from Penang, I am indebted to Mr. Boulenger.

<sup>2</sup> Proc. California Acad. Science, (4), III, p. 47, Dec. 1908.

<sup>3</sup> Herpetology of Japan, p. 422.



I recognize two forms which I define as follows : —

HYDROPHIS FASCIATUS FASCIATUS.

27 to 33 scales round the neck. 47 to 58 round the body. Ventrals 400 to 504 (531, Wall). Av. 455.

Habitat. Coasts of India and Burma to the Malay Archipelago.

HYDROPHIS FASCIATUS ATRICEPS.

25 to 30, usually 27 to 29, scales round the neck. 40 to 49, usually 43 to 45, round the body. Ventrals 327 to 452. Av. 366.

Habitat. Gulf of Siam and South China Sea to Malay Archipelago.

Both forms appear to extend their distribution into the seas of the Indo-Australian Archipelago, but the particular range of each one has yet to be determined.

HYDROPHIS FASCIATUS FASCIATUS.

The type specimens are in the Berlin Museum. Their habitat is unknown. Dr. Nelly de Rooy has kindly made enquiries for me and she is informed that they have 29 and 30 scales round the neck, 52 and 53 round the body, and 457 ventrals. This description accords with the form found west of the Malay Peninsula, and should therefore be designated the typical one.

The figures I have given above for this form, are based chiefly upon my series from the Straits of Malacca, but all the specimens that I have examined from the Indian coast also agree with them. Wall records examples from India with a lower body count, but as he enumerates at mid-body, another 3 or 4 may be added to his figures to arrive at the maximum number. Boettger records two specimens from Madras with 52 and 56 respectively.

This range of variation will also include *H. rhombifer* Blgr., (56 scales round the body, type locality coast of Perak), and *H. leptodira* Blgr. (58 scales round the body, type locality Mouth of the Ganges<sup>4</sup> ?), and that his two forms should now become synonyms of *fasciatus*, Mr. Boulenger is agreed. Wall, in his Monograph, came to this same conclusion, but in his conception of the species has included *H. brookii* Günther, a snake which I believe to be quite distinct.

Further collections from the coast of India may possibly modify the definition of this form as given above, but it will not alter the separation of the Malaccan race as distinct from that found in the Gulf of Siam.

*Variation.*—The following remarks concern my series from the Straits of Malacca. The rostral is as high as broad in one example ; the frontal is shorter than its distance to the rostral in two examples ; two postoculars occur in two examples ; the prefrontal shields fail to touch the supralabials on both sides in three examples, and on one

<sup>4</sup>The record is Cantor's and possibly in error.

side in two more ; the posterior temporal is as large as the anterior or larger ; a cuneiform scale is present in all after the third infralabial.

*Colour.*—None of my series (except one juvenile) is completely banded. Above they are pale grey, with from 60 to 80 dark grey dorsal rhombs, which in some of them are continued round the body as pale bands, but in the fore part of the body only. The transition from the dark dorsal rhomb to the paler ventral band occurs with a fairly clear line of demarcation. Below creamy white ; head, neck below, and anterior part of belly, black. One specimen, No. 1150, is very pale, being almost white in the posterior part of the body, with the dorsal marks only just visible.

To *H. fasciatus typica* I refer the *H. gracilis* recorded by Hanitsch (Rept. Raffles Mus., 1897, p. 101). For its scale formula see the table.

#### *Hydrophis fasciatus atriceps.*

*Hydrophis atriceps*, Günther, Rept. Brit. Ind., p. 371, pl. xxv, fig. 1 (1864).

*Disteira cincinnatii*, Van Denburgh and Thompson, Proc. California Acad. Science, (4), 111, p. 41, Dec. 1908.

The scalation and distribution of this form have already been dealt with.

Number of specimens examined, 60 ; Gulf of Siam, 58 ; Cap St. Jacques, 2.

The sudden and marked diminution in the number of scale rows and ventrals, as well as the alteration in colour, which characterizes nearly all my specimens from the Gulf of Siam as compared with those from the Straits, induced me for a long time to believe that they were distinct. I cannot however find any certain grounds upon which they can be separated. Between an example from Pulau Angsa, with 57 scales round the body, 504 ventrals, and the back with dark rhomboidal marks, and another from Ban Yao with 41 scales round the body, 327 ventrals, and the body marked with complete bands, there is every degree of gradation.

*Variation.*—As one would expect, with fewer scales round the body in proportion to those upon the neck, this form is relatively stouter anteriorly than the Malaccan one.

The rostral shield may be as broad as high ; the frontal shield in six examples is longer than its distance to the rostral, in two of these being in contact with the nasals. In No. 1261 the frontal is very small, much shorter than its distance to the rostral. The anterior temporal in one instance (No. 1252) is divided on one side to form two superposed shields ; the posterior temporal shield is seldom as large as the anterior, and is often divided in two by a vertical suture. Normally the supralabials are undivided, but in one instance there is fragmentation of the fifth. In five examples the temporal shield reaches the border of the mouth to the exclusion of the sixth and seventh labials. A



single cuneiform shield is invariably present after the third infralabial. 25 scales round the neck occurs twice in the series, 30 twice; 40 scales round the body occurs once, 49 five times. *Ventral variation.* Males, 327—396; females, 338—452. The ventral count of 452 (No. 2876) appears to be quite abnormal, the numbers next to it in succession being 434, 420, 416, 413. *H. lindsayi* agrees closely with this example.

*Colour.*—Greyish above, greenish- or yellowish-white below, with from 50 to 75 blackish annuli or dorsal bars. Head and anterior part of body below entirely black at all ages; sometimes a yellow spot behind the nostril or the eye. In No. 2873 these spots have coalesced to form a complete yellow horse shoe. All the specimens from Ban Yao and Chantabun are completely banded, the band being paler above than below but without any clear line of demarcation; those from Cap St. Jacques and the western side of the Gulf are, with one exception, coloured as the Malaccan specimens. Two specimens from Bangpakong form a connecting link between these two forms. No. 1309 has dorsal and ventral bars, the two meeting in a point on the side of the body.

*Distribution.*—Nearly all my specimens are from the mouths of two rivers, Chantabun and Ban Yao. At the latter spot it is the predominant form, nearly all the sea snakes coming from that locality belonging to this species.

*Breeding.*—In the Gulf young are born in February and March, from 4 to 8 being produced. Their markings are practically black and white.

*Dentition.*—The teeth of *H. fasciatus* are as follows:—posterior maxillary, 5; palatine, 6 or 7; pterygoid, 12 to 16; mandibular, 14 or 15 (8 specimens examined).

I have not examined any specimens of *Disteira cincinatii* Van Denburgh and Thompson, from Manila, but as already stated their description agrees so closely with that of my specimens from the Gulf, that I cannot but think they should be united. The slightly lower number of scale rows (38, 39) round the body, as shewn in three specimens of their series, would be accounted for by local variation, or perhaps the difference in our methods of counting.

#### *Hydrophis gracilis* (Shaw).

*Hydrophis gracilis*, Boulenger, Cat. Sn. B. M., III, p. 280 (1896); idem, Fauna Malay Pen. Rept. and Batr., p. 191 (1912); N. de Rooij, Rept. Ind. Aust. Archipel., II, p. 228 (1917); Wall, Journ. Bombay Nat. Hist. Soc. XXV, p. 602 (1918).

*Disteira gracilis*, Stejneger, Herpet. Japan, p. 427 (1907).

*Distira gracilis*, Wall, Mem. Asiat. Soc. Bengal, II (8), p. 198 (1909).

*Hydrophis rostralis*, Smith, Journ. Nat. Hist. Soc. Siam, II, p. 340 (1917).

Straits of Malacca, 9 exs; Gulf of Siam, 1 ex.

I believe now that my *H. rostralis* is only a *gracilis* after all. I was mislead in the first instance by the large number of body scales (35 to 41) which I found in my series, the

accredited count for *gracilis* being 29 to 33. Since then I have obtained a specimen having 33, and Wall has also published an account of a large series of *gracilis* obtained on the Indian coast (Journ. Bombay, Nat. Hist. Soc. l. c. s.). His maximum is only 33, but his count is made at mid-body, and I find on counting my own specimens at that point, an allowance of from 2 to 4 scales may be made for the difference in position.

This brings them much nearer to my own specimens, and as there appears to be no other character by which they can be separated, I unite them. Wall's series is a fine one of 36 examples, and should be fairly representative of the locality (Madras). After allowing for all discrepancies in our method of counting, however, there still remains a considerable difference between his series and mine with regard to the number of scales round the neck and body. I tentatively define the two forms as follows :—

#### MADRAS COAST.

17—19 round the neck ; 29—37 round the body. Ventrals, 215—297. Av. 251.

#### MALAY PENINSULA AND GULF OF SIAM.

19—23 round the neck ; 33—41 round the body. Ventrals, 250—302. Av. 279.

Two races appear to be clearly indicated, but with the type locality of this snake unknown, it would be as well to know something about the forms found elsewhere before proceeding to name them.

*Variation.*—The variation in my specimens is as follows:—Eye equal to or slightly less than its distance from the mouth ; rostral as broad as high or a little broader than high, the portion visible above equal to three-quarters or the entire length of the internasal suture ; frontal usually shorter than its distance to the rostral ; five or six supralabials, in one example only the fourth shield touching the eye. Fragmentation of the supralabials does not occur in any example, nor are there any small scales interposed between the infralabials.

*Colour*, (in alcohol). Pale bluish-grey on the upper half of the body, yellowish or whitish on the lower, the young with indistinct darkish dorsal bars or complete bands. Head grey, yellowing with age.

No. 1105 has 55 bands upon the body, about as broad as their interspaces on the sides of the body, slightly dilated dorsally and ventrally ; on the posterior part of the body they are very indistinct. Tail grey, blackish at the tip.

*Dentition.*—Posterior maxillary, 5 ; palatine, 8 ; pterygoid, 10—12 ; mandibular, 13 (3 specimens examined).

The type of my original *H. rostralis* is No. 1102, in the Selangor Museum, Kuala Lumpur.

#### *Hydrophis viperina* (Schmidt).

*Distira viperina*, Bouleng., Cat. Sn. B. M., III, p. 298 (1896) ; Wall, Mem. Asiat. Soc. Bengal, II (8), p. 239 (1909).



*Hydrophis viperinus*, N. de Rooij, Rept. Ind. Aust. Archipel. II, p. 231 (1917).

Gulf of Siam, 17 exs. Cap St. Jacques, Cochin China, 2 exs.

One of the specimens was seen to fall from the claws of a fishing eagle, and was picked up still alive and quite undamaged at some distance inland. This incident possibly explains the records of sea snakes which have been occasionally discovered at a considerable distance from their natural habitat.\*

For a small series, mine shew a wide range in the number of scale rows. They vary from 27 to 34 at the neck and from 37 to 50 round the body. Ventrals 181 to 264. A reference to the table will show that the extremely low ventral count of 181 is confined to a single individual, No. 2716. But for this specimen the variation in the number of these shields would be 232–264, a range which is almost exactly in accordance with what has been already given by Boulenger and Wall. It is an excellent example of the abnormality in ventral shields to which I have referred in the preliminary remarks.

As shewn by the table, the two specimens from Cochin China have a higher body count than any found in the Gulf.

*Colouration*.—Grey above, white below, with from 28 to 34 dark grey dorsal rhombs which are usually confluent vertically. My one juvenile is beautifully and conspicuously marked, but with age the pattern becomes obscured, and in some individuals has entirely disappeared, leaving the back of a uniform grey colour, which is separated from the white of the belly by a clear line of demarcation.

*Dentition*.—Posterior maxillary, 5; palatine, 7 or 8; pterygoid, 14 to 17; mandibular, 17 (4 specimens examined).

#### *Hydrophis jerdonii* (Gray).

*Hydrophis jerdonii*, Günther, Rept. Brit. Ind., p. 362 (1864); Boulenger, Cat. Sn. B. M., III, p. 299 (1896); idem, Fauna Malay Pen., Rept. and Batr., p. 186 (1912); N. de Rooij, Rept. Ind. Aust. Archipel., II, p. 232 (1917).

*Distira jerdonii*, Wall, Mem. Asiat. Soc. Bengal, II (8), p. 241 (1909).

Singgora, 3 exs.

*Variation*.—The anterior temporal reaches the labial margin on both sides in one example, and on one side in another. Chin-shields well developed (as figured by Günther, pl. XXV, fig. B), in all three examples. Wall

\* That numbers of sea snakes fall victim to birds of prey, was once demonstrated to me on visiting a large flat-topped buoy lying some miles out to sea in the Bight of Bandon. The top of this structure was covered with the dried bodies of snakes—chiefly *Enhydris hardwickii*—the birds having brought their victims there, and after devouring the internal organs, left the remainder to be disposed of by the elements.

states that in 17 individuals examined by him, three infralabials only were in contact with the chin-shields. All my specimens have four, the first three in contact with the anterior pair.

*Colour*.—The adult is light greyish above, yellowish-white below, with 50 broad black dorsal bars which are indistinctly carried round the body as narrow bands. The young have the back pale olivaceous, and the bands (40 and 48) more distinct below. Head pale olive with a dark mark on the snout.

*Dentition*.—Posterior maxillary, 8—9; palatine, 9; pterygoid, 14—15; mandibular, 19—20 (2 specimens examined).

#### *Thalassophis anomalus* Schmidt.

*Thalassophis anomalus*, Schmidt, Abh. Naturw. Hamb., II, 1852, p. 81, pl. 4; Boulenger, Cat. Sn. B. M., III, p. 269 (1896); Smith, Journ. Nat. Hist. Soc. Siam, II, p. 176, pl. (1916); Ouwens, De voor-naamste giftslangen van nederlandsch oost-indie (1916); N. de Rooij, Rept. Ind. Aust. Archipel., II, p. 223 (1917).

I have now examined 17 examples of this snake, all obtained from various localities at the head of the Gulf.

The following points may be added to my recent description. The eye may be slightly greater than its distance from the mouth. 27 to 30 scales round the neck, 31 to 35, usually 33, round the body. Ventrals 218 to 256.

The young may have a pale band across the snout and extending along either side of the head to join the white of the under surface.

*Dentition*.—Posterior maxillary, 5; palatine, 7; pterygoid, 20 to 22; mandibular, 18 or 19 (2 specimens examined).

Ouwen's coloured illustration of this species is not very representative of my specimens. The body is too elongate and the bars are much too dark.

#### *Thalassophis annandalei* (Laidlaw).

*Distira annandalei*, Laidlaw, P. Z. S., 1901, ii, p. 579, pl. xxxv, fig. 1.

*Thalassophis annandalii*, Boulenger, Fascic. Malay, Zool. i, p. 16 (1903); idem, Fauna Malay Pen., p. 195 (1912); Wall, Mem. Asiat. Soc. Bengal, ii, (8), p. 245 (1909); N. de Rooij, Rept. Ind. Aust. Archipel., II, p. 223 (1917).

Cap St. Jacques, Cochin China, 7 exs.; Singgora, 1 ex.

In cranial and in external characters this species differs so much from the genotype, *T. anomalus*, that the mere presence of a pair of internasals seems insufficient reason for placing them together. As a matter of fact, in one of my specimens these shields are almost entire, as is usual with *Hydrophis*, while in the others they are variously divided, and it would seem more correct to consider them as subject to irregular fragmentation, as has already been done with the other head shields.



When the anatomy of the Hydrophids comes to be better known, a considerable regrouping of many of the species will surely be necessary. *T. annandalei* should then, I think, be placed by itself; until this is done it may as well remain where it is.

The variation in my series is as follows :—Nasal shields usually divided, either longitudinally or transversely, into 4, 6, or 8 pieces; prefrontals usually divided into 3, 4 or 5 pieces; frontal and supraoculars entire; parietals separated from each other, and sometimes from the frontal, by small scales; supralabials irregularly divided, sometimes entire; anterior chin-shields well developed in 1 example (No. 3888), absent in all the others.

62 to 73 scales round the neck, 74 to 91 round the body, ventrals 320 to 368.

*Dentition*.—Posterior maxillary, 6; palatine, 8; pterygoid, 20; mandibular, 16 (1 specimen examined).

The type locality of this snake is Patani, and the specimens from there are said to have from 90 to 100 scales round the body. As will be seen by the annexed table, none of my series has so large a number.

#### *Enhydrina valakadyn* (Boie).

*Enhydrina valakadien*, Bouleng., Cat. Sn. B. M., p. 302 (1896); idem, Fauna Malay Pen., Rept. and Batr., p. 193 (1912).

*Enhydrina valakadyn*, Stejneger, Herpet. Japan, p. 437 (1907); Wall, Mem. Asiat. Soc. Bengal, II (8), p. 191 (1909); N. de Rooij, Rept. Ind. Aust. Archipel., II, p. 221 (1917); idem, J. Bombay N. H. S., XXVI, p. 803 (1919).

*Enhydrina valakadyn* is one of the most widely distributed, and without doubt the most common, of all the sea snakes. It has also been accorded a greater range of variation in the number of its scale rows (40 to 60 round the neck, 50 to 70 round the body), than any other known species.

This is true, but only when the species is considered as a whole, and without regard to the region whence the individuals have come. The very large series that I have been able to examine from the Malayan region shews that the variation in any one locality is considerably less—about 12 to 14—or, if the sexes are considered apart, seldom more than ten. The number of specimens that I have seen from the Indian coasts is not great, but in so far as they go they agree entirely with the Malayan examples in this respect.

I gather also from these Indian specimens, that the maximum average number of scale rows obtains in that region; and I find too that in the disposition of certain head shields they differ from the Malayan form.

Tentatively, therefore, I recognize two forms, which are as follows :—

#### AN INDIAN FORM.

*Forma valakadyn* (type locality, Tranquebar). 45 to 60 scales round the neck, 55 to 70 round the body; ventrals,

240 to 320 ; praefrontals usually in contact with the supralabials, 3rd and 4th labials usually touching the eye.

*Habitat.* Arabian Sea and coasts of the Indian Peninsula.

#### A MALAYAN FORM.

40 to 55 scales round the neck, 49 to 66 round the body ; ventrals 239 to 292 ; praefrontals usually not in contact with the supralabials (80%). fourth labial only touching the eye (60%).

*Habitat.* Coasts of the Malay Peninsula, Siam and Cochin China.

With this latter form I am able to deal very fully. Altogether I have examined about 140 examples : 60 of these are from the Straits of Malacca, and the remainder from the seas East of the Peninsula.

It is possible, if one cares to go more closely into detail, to separate this form again, the dividing line between them being the Peninsula. As, however, they differ only in a slight variation in the number of body scales without alteration in the head shields, it is preferable to consider them together. The actual variation is as follows :—

#### STRAITS OF MALACCA.

43—55 round the neck, 52—66 round the body. Ventrals, 239—278.

#### GULF OF SIAM.

40—52 round the neck, 49—62 round the body. Ventrals, 239—292.

In the whole series the praefrontals fail to touch the supralabials in 112 examples. In nearly every instance this occurs on both sides. In the same series the 4th labial only touches the eye in 85.

Females on the average have from 3 to 4 more scale rows round the neck and body than males. I find the sexual variation as follows :—

*Straits of Malacca.*—Males, 43—48 (av. 45) round the neck, 52—60 (av. 55) round the body, ventrals, 239—270. Females, 45—55 (av. 49) round the neck, 54—63 (av. 59) round the body, ventrals, 248—278.

*Gulf of Siam.*—Males, 40—48 (av. 43) round the neck, 49—59 (av. 53) round the body, ventrals, 243—292 (av. 264). Females, 42—52 (av. 46) round the neck, 51—62 (av. 56) round the body, ventrals, 239—287 (av. 260).

Abnormalities in this form are not uncommon, and such faults in development as partially divided frontals, fusion of the frontals with praefrontals, of oculars with labials, and oculars with each other, occur frequently. Fragmentation of the parietals to form a small interparietal occurs in about 50%.



**Colour.**—The colour of specimens from this region presents nothing that has not already been described. Four individuals, however, deserve comment. No. 2045, although adult, is still marked with narrow jet black dorsal bars in the posterior three-quarters of the body. Nos. 2047, 2048, 3856 have a broad black irregular band along either side of the body, a narrow ventral band, and irregular black dorsal spots. All three are from the same locality.

**Distribution.**—On both coasts of the Malay Peninsula this form is extremely common. At the head of the Gulf it is somewhat less numerous; along the East coast of the Gulf it is comparatively rare, and beyond Cap St. Jacques it has not yet been recorded.

**Breeding.**—Young are born in the Gulf in March and April. Until recently I had never seen more than 5 embryos to any female. Last year, however, I obtained one with 18, five in one oviduct and thirteen in the other.

**Dentition.**—Posterior maxillary, 3; palatine, 6–7; pterygoid, 14–17; mandibular, 15–16 (9 specimens examined).

***Enhydris hardwickii* (Gray).**

*Enhydris hardwickii*, Bouleng. Cat. Sn. B. M., III, p. 301 (1896); idem, Fauna Malay Pen., Rept. and Batr., p. 193 (1912); Wall, Mem. Asiat. Soc. Bengal, II (8), p. 247 (1909); Smith, Journ. Bombay N. H. S., XXIII, p. 787 (1915); Ouwens, De voornaamste giftslangen van Nederlandsch oost-indie, pl. 111 (1916).

*Lapemis hardwickii*, Stejneger, Herpet. Japan, pp. 401 and 435 (1907).

This is a common species in the Gulf of Siam and along the coast of the Malay Peninsula, and I have been able to examine a large series. I have specimens also from Cap St. Jacques, Cochin China, and no doubt it extends northwards up the coast of Annam, as it is said to be common along the Western shores of Luzon. Males appear to be far more numerous than females, the proportion in my series being three to one.

In the number of scales round the body, the range given by Boulenger is certainly too limited, particularly in the number round the middle of the body. My specimens shew a much greater variation, and in this respect are more in accordance with the figures given by Wall. The species is so distinct that it cannot be confused with any other form.

Sexual variation is well marked, the males having the lower count both in body scales and ventrals. Specimens from the West Coast of the Malay Peninsula do not appear to differ, either in scalation or in colouration from those found in Siamese waters.

The following table is drawn up from about 230 examples :—

**MALES.**

Round the neck :—23 to 29, usually 25 to 27. Round the body :—25 to 35, usually 27 to 33. Ventrals :—114 to 152.

## FEMALES.

Round the neck :—27 to 35 (usually 29 to 33). Round the body :—33 to 41 (usually 35 to 37). Ventrals :—141 to 230.<sup>1</sup>

That marked sexual variation existed in this species was observed long ago by Boettger in working on Philippine specimens. (Zool. Anz., p. 395, 1888), but his observations seem to have been overlooked by most authors in writing since.

Boettger's remarks apply chiefly to the ventral shields, and the figures he gives (I quote Stejneger, p. 401) are 135—168 for males, 186—237 for females. I cannot but think that had he worked on a larger series—he had only 31 specimens—the difference which he found between the sexes would have been less marked. Apart from this, his figures, both in range and average, are considerably higher than what is recorded by any other author for this species. It looks indeed as if the Philippine form differed from the others, although it is possibly due to the different method employed in counting these scales.<sup>2</sup>

*Colour*.—Greenish or yellowish olive above, whitish below, with from 35 to 50 dark grey or olive dorsal bars, tapering to a point on the sides. Variations to this are frequent. The dorsal bars may be continued round the body as complete bands, a form seen most frequently in juveniles. A narrow black ventral stripe is sometimes present, or less frequently, a broad irregular ventral band. Coalescence of the dorsal bars occurs in adults, and in some the entire back is of one uniform colour. One specimen (No. 2460) is uniform slate grey throughout. Young ones have the head black, with or without yellow markings across the snout and along the sides of the head.

Specimens from Koh Kong are, as a series, greyer and darker than those from the head of the Gulf, and are more prone to have ventral stripes and bars.

Ouwen's coloured figure is an excellent representation of many examples found at the head of the Gulf.

*Variation*.—Fission of the second supralabial to form a pseudo-loreal is not uncommon. 41 scales round the body occurs in 2 examples only, and in one of these (No. 3883), the ventral count is 230, the next number in sequence to it being 203 (No. 1391).

<sup>1</sup> Ventral counts are very tedious, and the figures given here are drawn mainly from specimens obtained in the Gulf of Siam.

<sup>2</sup> The ventral shields of *Enhydryis* are very irregular in their disposition, sometimes being broken up, with odd scales interposed here and there, sometimes missing altogether. The method I have used has been to control the count by means of the adjacent row of body scales, which, being uniform in their sequence, indicate what the correct ventral count should be.



The ventral spines of the males appear to be longer and larger in individuals from the head of the Gulf, than in those from any other locality I have examined. Possibly, being a sexual character, they increase in size in the breeding season.

*Dentition.*—Posterior maxillary, 4 to 6\* ; palatine, 6 or 7 ; pterygoid, 17 to 20 ; mandibular, 14 or 15 (9 specimens examined).

*Breeding.*—In the Gulf young are born in April and May, from 2 to 5 being produced. In length they vary from 250 to 300 mm.

*Aipysurus eydouxii* (Gray).

*Aipysurus eydouxii*, Boulenger, Fauna Malay Pen., Rept. and Batr., p. 195 (1912) ; Wall, Mem. Asiat. Soc. Bengal, ii (8), p. 189 (1909) N. de Rooij, Rept. Ind. Aust. Archipel. II, p. 219 (1917).

Gulf of Siam, 11 exs.

In three examples the praefrontal is divided ; in one the 3rd and 4th supralabials touch the eye on both sides. The ventral keel is variable ; in four examples it is poorly developed ; in three others each keel in the fore-part of the body bears a strong spinose tubercle, and there is a series of small tubercles along the adjacent row of body scales for nearly the same distance.

One specimen was caught some 20 feet above high water mark, and in life had a rich slate-blue iridescence.

*Colour.*—Yellowish, with from 44 to 55 dark olive dorsal bars, which taper to a point on the sides and are usually confluent vertically. Head dark olive ; entirely black in the young.

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\* Boulenger in his description of this genus, gives the number of teeth behind the poison fangs as from 2 to 4. I cannot find any of my specimens with less than 4.

LIST OF SPECIMENS OF *Hydruis platurus*.

No.	Locality.	Sex.	Length.		Scales		Collector.	Date.
			Total.	Tail.	Neck.	Body.		
<i>Gulf of Siam.</i>								
1101	Hua Hin	..	230	30	40	49	M. A. Smith	June, 1915.
3619	"	..	vg. 350	37	49	59	S. G. Lambert	1919.
3838	" Gulf of Siam	..	325	40	44	54	M. A. Smith	July, 1919.
3839	"	..	325	35	40	51	"	"
3840	"	..	350	45	49	59	"	"
3841	"	..	310	34	42	54	"	"
3842	"	..	300	34	49	58	"	"
3843	"	..	255	30	48	58	"	"
3844	"	..	imm.	30	47	57	"	"
3845	"	..	290	35	47	59	"	"
3846	"	..	imm.	35	39	49	"	"
3847	"	..	"		50	60	"	"
3848	"	..	"		46	56	"	"
3849	"	..	"		47	57	"	"
3850	"	..	260	30	47	58	"	"
3851	"	..	imm.		48	58	"	"
3852	"	..	"		41	52	"	"
3853	"	..	"		43	52	"	"
3854	"	..	255	32	48	58	"	"
3855	"	..	imm.		48	58	"	"
<i>Straits of Malacca.</i>								
3903	Pulau Angsa	..	vg. 585	75	44	52	F. M. S. Mus.	June, 1918.
3904	"	..	hf. gr.		55	68	"	"
3905	"	..	760	90	55	67	"	"
3906	"	..	hf. gr.		52	63	"	"
3914	"	..	vg.		52	62	"	"
3915	"	..	hf. gr.		44	56	"	"
3907	" Bagan Datoh	..	48	80	50	60	"	July, 1918.
3908	" Klang Straits	..	640		48	62	"	Feb., 1915.
4097	"	..	565	70	50	62	"	"



TABLE OF VARIATIONS BETWEEN *H. ornatus*, *godeffroyi* AND *lamberti*.

	Neck.	Body	Vents	P. M. Teeth.	Dorsal bars or bands.
<i>H. godeffroyi</i> ..	28—34	38—43	227—294	12—13	54—68
<i>H. ornatus</i> ..	31—42	40—50	210—300	10—11 (Wall)	35—45
<i>H. lamberti</i> ..	45	55	281—302	10—11	35—38

LIST OF SPECIMENS OF *Hydrophis godeffroyi*.

No.	Locality.	Sex	Length.		Scales		Caudals.	Collector.	Date.
			Total.	Tail.	Neck.	Body.			
1234	Cap St. Jacques	♂	615	70	33	39	47	M. A. Smith	June, 1918.
1235	"	♂	465	55	31	38	43	"	

LIST OF SPECIMENS OF *Hydrophis cyanocinctus*.

No.	Locality.	Sex.	Length.		Scales.		Ventrals.	Caudals.	Collector.	Date.
			Total	Tail.	Neck.	Body.				
Gulf of Siam.										
1310	Hua Hin	♂	1205	105	33	41	328	45	Mrs. T. H. Lyle	July, 1917.
1311	Bangpakong	♂	1400	120	30	39	368	..	M. A. Smith	May, 1917.
	"	♂	945	65	29	43	389	..		
1312	Tachin	♂	1885	135	31	43	373	45	Mr. H. C. Andersen	May, 1918.
1313	Meklong	♂	1550	120	28	42	364	42	M. A. Smith	Feb., 1918.
1314	Hua Hin	♂	865	75	29	39	373	46	Mr. S. H. Lambert	July, 1917.
1315	Singgora	♂	1055	105	29	39	360	48	Mr. Chadwick	Oct., 1913.
1316	Bangpakong	♂	1080	90	29	39	321	48	M. A. Smith	March, 1917.
1317	"	♂	1410	90	31	42	350	38	"	"
1318	Meklong	♂	1460	90	29	42	314	..	"	"
1319	"	♂	1210	110	29	39	351	..	"	Feb., 1917.
1778	"	♂	1450	100	31	41	351	..	"	Jan., 1918.
3871	Singgora	♂	1720	130	29	39	340	47	"	July, 1919.
Cochin-China.										
1327	Cap St. Jacques	♂	1020	80	29	39	374	46	"	June, 1918.
1328	"	♂	990	70	28	39	374	42	"	"
1329	"	♂	1225	85	31	39	353	39	"	"
1330	"	♂	1420	100	31	43	361	40	"	"
1331	"	♂	800	70	28	38	353	50	"	"
1332	"	♂	930	70	31	41	352	43	"	"
1333	"	♂	1015	75	29	39	358	41	"	"
1334	"	♂	870	70	31	41	369	50	"	"
1335	"	♂	850	75	31	39	362	51	"	"
1336	"	♂	635	50	29	37	324	48	"	"
1337	"	♂	640	55	31	39	381	..	"	"



LIST OF SPECIMENS OF *Hydrophis cyanocinctus*—Continued.

No.	Locality.	Sex	Length.		Scales.		Ventrals.	Caudals.	Collector	Date.
			Total	Tail.	Neck.	Body.				
<i>Straits of Malacca.</i>										
1321	Kuala Kurau	..	1215	115	30	42	331	48	F. M. S. Mus.	Aug., 1917.
1320	Londang	..	1690	120	31	42	337	45	"	May, 1917.
1326	Kuala Larut	..	675	55	35	44	328	45	"	Sept., 1916.
2867	Kuala Kurau	..	1075	95	33	43	377	..	"	Aug., 1917.
2868	"	..	1215	115	30	42	331	..	"	"
2869	"	..	1260	110	29	42	358	..	"	"
2870	"	..	1185	85	33	43	352	..	"	"
2773	"	..	ad.	..	33	45	370	57	"	Jan., 1918.
2774	"	..	"	..	32	47	325	46	"	"
2775	"	..	"	..	35	47	356	45	"	"
3916	Pulau Angsa	..	hf. gr.	..	33	43	325	..	"	"
3917	"	..	1040	90	31	41	310	..	"	June, 1918.
3918	"	..	hf. gr.	..	33	43	302	..	"	"
3919	"	..	"	..	33	43	306	..	"	"
3920	"	..	yg. imm.	..	31	39	292	..	"	"
3921	"	..	915	85	33	43	332	..	"	"
3922	"	..	..	..	30	41	312	..	"	"

LIST OF SPECIMENS OF *Hydrophis melanosoma*.

No	Locality.	Length		Scales.		Ventrals	Snout.	Collector.	Date.
		Total	Tail	Neck	Body				
1120	Kuala Kurau	965	120	27	39	302	62	F. M. S. Mus.	Aug., 1917.
1121	"	1115	115	25	37	344	54	"	"
1122	"	imm.		27	37	306	48	"	"
1123	"	930	90	27	39	266	48	"	"
1124	"	970	115	27	37	284	..	"	"
1125	"	1135	135	27	37	287	..	"	"
1126	"	hf. gr.		27	39	299	..	"	"
1127	"	560	60	25	37	295	56	"	"
1128	"	570	50	27	39	303	..	"	"
1129	"	615	65	27	39	308	..	"	"
2780	"	ad		27	37	285	52	"	Feb., 1918.
2781	"	1020	110	27	39	309	57	"	"
2782	"	875	85	27	39	301	50	"	"
2783	"	385	35	27	37	285	50	"	"
2784	"	ad.		27	39	299	..	"	"
	Perak?	940	..	27	37	296	..	Type " of <i>H. uragi</i>	"
	"	1250	130	27	38	335	..	" <i>H. melanosoma</i>	"



LIST OF SPECIMENS OF *Hydrophis brugmansii*.

No.	Locality.	Sex.	Length.		Scales.		Ventrals.	Caudals.	Collector.	Date.
			Total	Tail	Neck	Body				
1202	Kuala Kurau	♀	1005	75	31	38	327	42	F. M. S. Mus.	Aug., 1917.
2787	"	♀	1245	95	31	38	324	42	"	Jan., 1918.

LIST OF SPECIMENS OF *Hydrophis torquatus torquatus*.

No.	Locality.	Sex.	Length.		Scales.		Ventrals.	Caudals.	Collector.	Date.
			Total.	Tail.	Neck.	Body.				
1413	Londang	..	645	75	34	43	301	51	F. M. S. Mus.	May, 1917.
1414	"	..	485	50	37	47	282	35	"	"
1417	"	..	565	65	34	43	272	42	"	"
1421	"	..			33	43	280	50	"	"
4001	"	..	605	65	33	43	280	..	"	"
4003	"	..	605	60	35	47	260	..	"	"
4006	"	..	670	80	33	43	304	..	"	"
"4007	"	..	575	60	35	45	262	..	"	"
4099	"	..	670	70	35	47	242	..	"	"
1415	Kuala Kurau	..	580	70	34	45	275	45	"	Aug., 1917.
1416	"	..	580	60	35	44	262	41	"	"
1418	"	..	505	55	35	47	262	39	"	"
1419	"	..	590	65	35	45	263	43	"	"
2855	"	..	710	70	33	47	276	..	"	"
2854	"	..	ad.		33	45	277	..	"	Sept., 1916.
3956	"	..	625	70	35	45	296	..	"	"
3957	"	..	755	75	37	49	306	39	"	"
3958	"	..	640	80	33	43	280	..	"	"
3955	"	..	705	85	35	44	277	..	"	"
1412	Bernam River	..	695	65	35	45	272	38	"	1916.
1420	"	..	ad.		33	43	283	40	"	"

\* gravid, 3 embryos.



List of Specimens of *Hydrophis torquatus aagaardi*.

No.	Locality.	Sex	Length.		Scales.		Ventrals.	Caudals.	Collector.	Date.
			Total.	Tail.	Neck.	Body.				
1169	Bangnara, Patani	..	920	120	34	43	305	47	C. J. Aagaard	July, 1917.
1170	"	..	815	85	35	43	295	45	"	"
1171	"	..	830	110	33	42	282	56	"	"
1172	"	..	830	110	36	43	280	59	"	"
1173	"	..	570	65	34	42	302	45	"	"
1274	"	..	550	70	35	43	287	..	"	"
1266	"	..	595	75	34	43	306	60	"	"
1270	"	..	595	65	37	45	307	47	"	"
1270	"	..	655	85	33	39	300	57	"	"
1174	"	..	610	75	34	43	288	54	"	"
1273	"	..	..	..	35	43	300	44	"	"
1267	"	..	570	60	35	45	300	..	"	"
1760	"	..	520	65	35	45	320	60	"	"
1269	"	..	ad.	..	34	40	296	53	"	"
1734	"	..	..	..	35	43	294	46	"	"
1735	"	..	..	..	35	43	298	59	"	"
1736	"	..	..	..	32	40	279	49	"	"
1737	"	..	880	115	33	40	282	60	"	"
1738	"	..	ad.	..	35	42	276	56	"	"
1739	"	..	..	..	34	44	278	38	"	"
1740	"	..	..	..	33	40	307	60	"	"
1741	"	..	920	120	33	42	309	51	"	"
1742	"	..	ad.	..	36	46	312	52	"	"
1744	"	..	820	110	36	46	305	47	"	"
1745	"	..	ad.	..	36	47	305	47	"	"
1872	"	..	imm.	..	36	45	306	60	"	"
1873	"	..	..	..	35	45	325	58	"	"
1874	"	..	..	..	34	43	305	47	"	"
1875	"	..	..	..	35	44	321	46	"	"
1876	"	..	..	..	36	44	308	58	"	"
1877	"	..	..	..	35	47	307	53	"	"
1878	"	..	..	..	36	45	290	47	"	"
1879	"	..	..	..	35	45	295	..	"	"
2895	"	..	ad.	..	36	45	305	55	"	"
2900	"	..	imm.	..	33	41	306	..	"	"

SPECIMENS OF *Hydrophis torquatus siamensis*.

No.	Locality.	Sex.	Length.		Scales.		Ventrals.	Caudals.	Collector.	Date.
			Total.	Tail.	Neck.	Body.				
1152	Ban Nao	♂	775	100	32	39	302	55	V. Petersen	July, 1917.
1151	"	..	895	115	32	38	289	50	"	Sept. 1917.
1163	"	..	805	75	34	42	343	46	"	Aug., 1917.
1264	"	..	795	105	32	40	306	54	"	Sept. 1917.
1265	"	..	840	90	34	41	288	50	"	"
1998	"	..	imm.		32	39	283	52	"	"
1154	Chantabun	♂	890	100	33	41	293	44	"	July, 1916.
*1155	"	..	915	95	29	37	298	44	M. A. Smith	March, 1916.
1157	"	..	965	125	32	40	290	52	"	"
1158	"	..	675	80	31	40	271	46	"	"
1159	"	..	700	75	34	39	293	50	"	"
1160	"	..	725	100	32	38	294	50	"	"
1119	"	..	1045	105	32	38	286	..	"	"
1167	"	..	ad.		33	39	294	..	"	"
*1165	"	..	925	100	31	39	304	45	"	"
2894	"	..	imm.		33	38	288	..	"	"
1161	Klong Yai	♂	830	90	32	36	308	48	C. Boden Kloss	Jan., 1915.
1156	Bangpakong	..	830	90	29	36	314	48	M. A. Smith	Sept. 1917.
1153	"	..	860	110	31	36	309	54	"	May, 1917.
1162	"	..			31	37	301	50	"	"
1164	"	..	650	70	29	35	290	..	"	"
*1291	Meklong	♂	845	90	31	39	308	47	"	Feb., 1918.
1429	"	..	645	55	31	37	300	42	"	"
1297	"	..			29	35	304	46	"	"
*1431	"	..	815	80	33	39	329	44	"	"
1289	"	..	790	80	31	39	286	44	"	"
1279	"	..	840	90	31	37	309	44	"	"
1306	"	..	890	90	31	39	312	..	"	"

\* gravid, with 3, 8, 3, 7, 3, 3, 7 embryos, in the order named.



SPECIMENS OF *Hydrophis torquatus siamensis*—Continued.

No.	Locality.	Sex	Length.		Scales		Ventrals	Caudals.	Collector.	Date.
			Total.	Tail.	Neck.	Body.				
1287	Meklong	..	imm.		31	37	315	54	M. A. Smith	Feb., 1918.
1427	"	..	"		31	38	308	48	"	"
1281	"	..	"		30	35	289	44	"	"
1303	"	..	"		34	41	310	43	"	"
1282	"	..	"		31	37	291	51	"	"
1433	"	..	"		31	39	296	48	"	"
1298	"	..	"		31	37	298	44	"	"
1293	"	..			29	37	295	44	"	"
1307	"	..	615	65	32	41	299	51	"	"
1294	"	..			31	35	298	43	"	"
1300	"	..	835	85	31	39	335	45	"	"
1283	"	..	imm.		35	40	313	56	"	"
1435	"	..	690	60	31	37	305	42	"	"
1301	"	..	805	100	31	37	295	49	"	"
1290	"	..	860	80	31	39	328	52	"	"

\* gravid, with 3, 8, 3, 7, 3, 8, 7 embryos in the order named.

SPECIMENS OF *Hydrophis caeruleus caeruleus*.

No.	Locality.	Sex	Length.	Scales.	Caudals.	Ventrals.	Collector.	Date.
			Total	Tail.	Neck	Body		
<i>India.</i>								
829	Bombay	♂	ad.	37	47	295	Bombay N. H. S. Mus.	
830	"	♂	imm.	35	45	269	"	
222.4	"	♂	"	37	47	315	"	
222.2	"	♂	"	37	47	312	"	
828	"	♂	"	38	47	308	"	
222.1	Karwar	♂	"	36	45	292	"	
831	Madras	♂	ad.	39	49	332	"	
14493	Puri	♂	"	43	51	313	Indian Mus.	
1445	India	♂	510	65	39	302	F. M. S. Mus.	
<i>Straits of Malacca.</i>								
1444	Kuala Kurau	♂	635	55	38	47	42	Aug., 1917.
3068	"	♂	570	45	38	48	253	"
3069	"	♂	620	60	37	41	288	"
3070	"	♂	ad.		36	44	297	"
3071	"	♂	730	70	38	44	292	"
1440	"	♂	ad.		37	47	302	"
1441	"	♂	"		35	42	319	"
3072	"	♂	610	60	36	45	276	"
3073	"	♂	ad.		39	47	306	"
3074	"	♂	785	70	35	45	292	"
2214	"	♂	670	70	37	47	302	"
1772	"	♂	ad.		36	44	294	46
1773	"	♂	"		37	43	275	"
2778	"	♂	"		34	42	304	"
2779	"	♂	"		37	47	282	Feb., 1918.
							291	"
							34	"

The numbers referred to under Bombay N. H. S. Mus., and Indian Mus., are the registered numbers of those Museums, not my own.



SPECIMENS OF *Hydrophis caeruleus caeruleus*—Continued.

No.	Locality.	Sex	Length.		Scales.		Ventrals.	Caudals.	Collector.	Date.
			Total.	Tail.	Neck.	Body.				
<i>Straits of Malacca—Continued.</i>										
3075	Londang	♂	ad.		36	44	283	47	F. M. S. Mus.	May, 1917.
1437	"	♂	630	65	38	46	306	42	"	"
1436	"	♂	680	65	36	45	312	45	"	"
1438	"	♂	645	65	38	46	287	45	"	"
1443	"	♂	675	75	38	43	286	45	"	"
3076	"	♂	imm.		38	45	278	..	"	"
3077	"	♂			35	46	310	..	"	"
	"	♂	740	65	41	50	280	..	"	"
*3998	"	♂	605	55	35	46	293	..	"	"
*3999	"	♂	730	60	38	45	308	..	"	"
17529	Mergui Archipelago	♂			37	43	283	46	Indian Mus.	"
11498	"	♂			35	45	283	45	"	"

\* gravid, 4 embryos each.

LIST OF SPECIMENS OF *Hydrophis caerulescens* thai.

No.	Locality.	Sex	Length.		Scales.		Ventrals.	Caudals.	Collector.	Date.
			Total.	Tail.	Neck.	Body.				
1353	Hua Hin	♂	665	75	33	39	268	46	S. J. Lambert	June, 1917.
1351	Tachin	♂	725	65	35	43	300	45	H. C. Andersen	Jan., 1914.
1360	Ban Yao	♂	680	70	34	41	305	43	M. A. Smith	1917.
1362	Bangpakong	♂	380	40	35	43	278			
1358	Hua Hin	♂	660	60	36	46	300	45	Mrs. T. H. Lyle	June, 1917.
1355	Bangpakong	♂	610	70	36	45	300?		M. A. Smith	" 1915.
1354	Hua Hin	♂	ad.		36	44	308	46	"	1917.
1356	Tachin	♂	yg.		37	45	302	41	"	1917.
1340	Meklong	♂	650	65	32	42	306	44	"	Feb., 1918.
1341	"	♂	740		35	44	304	44	"	"
1338	"	♂			36	46	262	45	"	"
1347	"	♂	ad.		32	42	285	49	"	"
1346	"	♂	yg.		35	41	308	50	"	"
1361	"	♂	"		35	45	266	39	"	"
1345	"	♂	imm.		36	46	286	42	"	"
1343	"	♂	yg.		33	43	294		"	"
1349	"	♂	"		36	44	275		"	"
1352	"	♂	"		31	38	293		"	"
1583	Ban Yao	♂	770	80	35	42	334	52	V. Petersen	Sept., 1918.
2697	Tachin	♂	ad.		34	41	268	58	H. C. Andersen	Dec., 1918.
2747	Koh Kong	♂	605	55	36	45	281	38	M. A. Smith	"
2748	"	♂	665	65	37	45	316	47	"	"
2749	"	♂	imm.		35	43	298	43	"	"
2750	"	♂	"		35	41	300	46	"	"
2751	"	♂	ad.		36	41	302	40	"	"
1365	Cap St. Jacques	♂	715	75	38	41	285	41	"	June, 1918.
1366	"	♂			36	43	305	50	"	"
1367	"	♂			38	48	322?		"	"



LIST OF SPECIMENS OF *Hydrophis klossi*.

No.	Locality.	Sex.	Length.		Scales.		Ventrals.	Caudals.	Collector.	Date.
			Total.	Tail.	Neck.	Body				
<i>Straits of Malacca.</i>										
1185	Kuala Kurau	..	1180	95	25	33	364	43	F. M. S. Mus.	Aug., 1917.
2902	"	..	1300	110	25	35	380	47	"	"
1186	"	..	930	90	23	33	369	47	"	"
2903	"	..			25	33	369	51	"	"
1187	"	..			25	33	377	46	"	"
1188	"	..	450	48	23	33	365		"	"
2904	"	..	810	70	23	33	367		"	"
2905	Londang	..	ad.		25	33	380		"	May, 1917.
1762	"	..	"		25	33	375	55	"	"
2906	"	..	"		23	33	360		"	"
2907	"	..	"		25	35	386		"	"
2908	"	..	"		23	31	380		"	"
2909	"	..	880	90	25	33	372	54	"	"
1181	"	..	ad.		23	33	367	55	"	"
1182	"	..	"		25	33	376	55	"	"
*1184	Kuala Larut	..	1180	90	23	35	361	41	"	Sept., 1916.
*2910	"	..	1090	80	23	33	363		"	"
<i>Gulf of Siam.</i>										
1180	Tachin	..	1000	80	25	35	395	42	M. A. Smith	Dec., 1913.
"	"	..	ad.		25	37	393		"	"
"	"	..	1010	85	27	37	376		"	July, 1914.
"	Chao Praya River	..	1090	115	25	35	360		"	Dec., 1914.
1183	Bangnara	..	1005	80	23	33	389	58	G. E. Webb	June, 1914.
1189	Meklong	..	ad.		25	35	392	41	C. J. Asgaard	1917.
+ 1190	"	..	1030	80	25	35	372	44	M. A. Smith	Feb., 1918.
+ 1191	"	..	1040	80	25	35	396	44	"	"
+ 1192	"	..	1100	90	23	33	394	44	"	"
1193	"	..	1120	90	25	33	382	43	"	"
2696	Tachin	..	870	70	23	35	400	42	"	"
2874	Bangkok	..	770	60	25	37	402	48	"	Dec., 1918.
3872	Singora	..	720	55	25	39	397	43	"	Feb., 1919.
		..	915	75	25	37	400	46	"	July, 1919.

\* gravid, 3 and 5 embryos respectively.

† gravid.

LIST OF SPECIMENS OF *Hydrophis consobrinus*.

No.	Locality.	Sex.	Length.		Scales.		Ventrals.	Caudals.	Collector.	Date.
			Total.	Tail.	Neck.	Body.				
<i>Straits of Malacca.</i>										
3978	Kuala Kurau	♂	805	80	31	45	356	..	F.M.S. Mus.	Aug., 1917.
1141	"	ad.	875	85	30	42	387	..	"	"
3947	"	imm.	815	75	28	44	360	..	"	"
3943	"	ad.	825	85	28	42	362	..	"	"
3944	"	imm.	815	75	28	39	364	..	"	"
3945	"	ad.	825	85	31	42	344	..	"	"
3952	"	ad.	825	85	29	41	362	49	"	"
1142	"	"	825	85	30	42	384	..	"	"
3977	"	"	825	85	29	43	360	42	"	"
1143	"	ad.	825	85	31	41	342	..	"	"
3948	"	ad.	825	85	31	42	340	..	"	"
3976	"	ad.	825	85	30	40	360	..	"	"
3946	"	ad.	825	85	31	43	378	..	"	"
3980	"	ad.	835	80	31	41	396	..	"	"
1764	"	ad.	860	80	29	43	362	48	"	"
1138	"	ad.	860	80	29	43	386	46	"	"
2216	"	ad.	900	80	29	43	390	..	"	"
1765	"	ad.	900	80	31	43	373	47	"	"
1219	"	ad.	820	85	30	44	370	47	"	"
1139	"	ad.	820	85	29	40	356	49	"	"
3973	"	ad.	895	85	28	43	369	..	"	"
2217	"	ad.	895	85	28	44	378	..	"	"
3949	"	ad.	895	85	29	43	349	43	"	"
1140	"	ad.	895	85	29	39	385	..	"	"
3938	"	ad.	895	85	29	41	328	..	"	"
3939	"	ad.	895	85	30	41	380	..	"	"
3975	"	ad.	895	85	30	41	380	..	"	"



LIST OF SPECIMENS OF *Hydrophis consobrinus*—Continued.

No.	Locality.	Sex.	Length.		Scales.		Ventrals.	Caudals.	Collector.	Date.
			Total.	Tail.	Neck.	Body.				
Straits of Malacca—Continued.										
1228	Kuala Larut	ad.	60	70	29	41	348	40	F. M. S. Mus	Aug., 1917.
3950	"	860			31	41	356		"	"
3941	"	ad.			29	40	338		"	"
3942	"				29	43	360		"	"
3951	"				31	43	376		"	"
3974	"				30	43	361		"	"
*2791	Kuala Kurau	880	70	80	30	42	369	46	"	Jan., 1918.
2792	"	815	85		29	41	354	51	"	"
2793	"	810	80		29	41	372	48	"	"
2794	"	825	70		30	41	356	43	"	"
2789	"				27	39	348	53	"	"
2790	"				31	43	360	50	"	"
+ 1144	Kuala Larut	965	75		31	45	360	45	"	Sept., 1916.
1230	"	955	95		29	42	380	50	"	"
1145	Trang Coast	ad.			31	43	362	52	"	Dec., 1916.
3970	Pulau Angsa	845	90		30	43	367	51	"	June, 1918.
3971	"	ad.			31	43	372	42	"	"
Gulf of Siam.										
1132	Bangpakong	1035	115		27	41	391	53	M. A. Smith	Feb., 1917.
1134	"	760	75		27	41	384	50	"	"
1133	"	805	90		25	37	375	54	"	May, 1917.
1208	"	370	38		25	37	372	52	"	"
1135	"	juv.			27	39	395	51	"	"
1216	"	"			27	39	386	51	"	"
+ gravid, 5 fully developed embryos.										
+ gravid, 7 small embryos.										

+ gravid, 5 fully developed embryos.

+ gravid, 7 small embryos.

LIST OF SPECIMENS OF *Hydrophis consobrinus*—Continued.

No.	Locality.	Sex.	Length.		Scales.		Ventrals.	Caudals.	Collector.	Date.
			Total.	Tail.	Neck.	Body.				
Gulf of Siam—Continued.										
1217	Bangpakong	♂	juv.		27	37	372	..	M. A. Smith	May, 1917.
1218	"	..	"		27	39	371	..	"	"
1136	"	..	"		27	39	401	..	"	"
1137	"	..	"		25	37	375	..	"	"
1229	Meklong	..	imm.		27	39	379	61	"	"
3867	Singgora	..	845	100	27	38	366	56	"	Feb., 1918.
3868	"	..	845	100	26	38	374	60	"	July, 1919.
3869	"	..	yg. ad.		27	38	358	..	"	"
3873	"	..	ad.		27	37	370	..	"	"
3874	"	..	855	75	27	39	376	..	"	"
3875	"	..	ad.		27	37	362	49	"	"
3876	"	..	imm.		26	39	384	53	"	"
Indo-China.										
1232	Cap St. Jacques	♂	925	105	29	41	388	49	"	June, 1918.
1231	"	♂	915	80	29	43	387	57	"	"
1233	"	..	915	80	30	43	400	56	"	"



LIST OF SPECIMENS OF *Hydrophis fasciatus fasciatus*.

No.	Locality.	Sex.	Length.		Scales.		Ventrals.	Caudals.	Collector.	Date.
			Total.	Tail.	Neck.	Body.				
<i>Straits of Malacca.</i>										
1147	Kuala Larut	♂	850	70	31	53	485	50	F. M. S. Mus.	Sept., 1916.
*1148	"	..	850	50	31	51	471	46	"	"
*1149	"	..	860	60	31	58	475	47	"	"
1150	"	..	880	80	31	55	450	52	"	"
2856	"	♂	900	?	33	55	474	..	"	"
2857	"	..	..	..	31	55	460	..	"	"
2858	"	..	..	..	33	57	480	..	"	"
2859	"	..	..	..	31	49	476	..	"	"
2860	"	..	..	..	29	50	436	..	"	"
2788	Kuala Kurau	♂	915	65	31	51	428	48	"	"
3968	Pulau Angsa	♂	685	50	33	57	504	..	"	"
3969	"	♂	720	70	31	51	430	..	"	"
4094	Perak	♂	875	80	29	51	414	56	"	"
	Perak Coast	..	620	47	31	55	422	..	Type of <i>H. rhombifer</i>	June, 1918.
	? Singapore	..	430	..	31	58	478	..	<i>H. gracilis</i> of Hanitsch	"
	Penang	..	..	..	31	48	430	..	Cantor's specimen	"

\* gravid, with 3 embryos each.

Type of *H. rhombifer*  
*H. gracilis* of Hanitsch  
Cantor's specimen

LIST OF SPECIMENS OF *H. fasciatus atriceps*.

No.	Locality.	Sex.	Length.		Scales.		Ventrals.	Caudals.	Collector.	Date.
			Total.	Tail.	Neck.	Body.				
<i>Gulf of Siam.</i>										
1239	Ban Yao	♂	760	70	26	41	336	51	V. Petersen	Aug., 1917.
1240	"	..	810	80	27	45	347	47	"	"
1241	"	..	900	70	27	47	374	49	"	July, 1917.
1242	"	..	825	75	28	43	363	52	"	"
1243	"	..	ad.	75	28	46	370	58	"	"
1244	"	..	800	75	26	42	349	48	"	"
1245	"	..	850	85	26	41	327	46	"	"
1246	"	..	imm.	..	27	45	434	56	"	"
1247	"	..	505	40	28	47	383	..	"	"
1248	"	..	ad.	..	27	43	354	45	"	"
1250	"	..	970	70	29	46	394	51	"	"
1251	"	..	ad.	..	27	45	368	52	"	"
1252	"	..	665	60	28	44	336	54	"	"
*2215	"	..	900	60	27	45	374	..	"	Dec., 1917.
†1253	"	..	975	70	27	46	416	53	"	"
†1254	"	..	890	65	27	45	338	42	"	"
1255	"	..	715	55	29	46	406	49	"	"
1256	"	..	imm.	..	27	44	389	56	"	"
1257	"	..	..	..	27	41	344	48	"	"
1259	"	..	630	60	27	44	368	55	"	"
1581	"	..	855	80	29	46	348	50	"	Aug., 1918.
1582	"	..	930	90	27	42	354	50	"	"
..1657	"	..	925	90	25	41	325	48	"	"
1658	"	..	ad.	..	28	44	386	52	"	"
1989	"	..	1000	100	27	44	360	53	"	Sept., 1917.
1990	"	..	imm.	..	29	45	358	46	"	"
1996	"	..	"	..	27	47	413	38	"	"

\* gravid, 8 embryos.

† gravid, 6 embryos.

‡ gravid.



LIST OF SPECIMENS OF *H. fasciatus atriceps*—Continued.

No.	Locality.	Sex.	Length.		Scales.		Ventrals.	Caudals.	Collector.	Date.
			Total.	Tail.	Neck.	Body.				
<i>Gulf of Siam—Continued.</i>										
1236	Chantabun	..	945	85	26	40	348	51	M. A. Smith	March, 1916.
1237	"	..	345	27	29	43	358	..	"	"
1238	"	..	640	52	29	45	..	..	"	"
1769	"	..	ad.	65	26	43	360	..	"	"
2873	Bangpakong	..	675	80	29	45	393	52	"	Feb., 1919.
2875	"	..	760	75	27	45	388	65	"	"
2876	"	..	915	75	29	49	452	62	"	"
2714	"Kong	..	ad.	40	25	44	386	48	"	"
1260	Meklong	..	490	40	29	47	398	55	"	Dec., 1918.
1261	Tachin	..	665	50	29	49	387	58	"	Feb., 1918.
1249	Hua Hin	..	830	65	29	44	386	46	"	July, 1917.
1309	Bandon	..	yg.	..	27	45	420	54	S. J. Lambert	June, 1917.
					27	45			M. A. Smith	Aug., 1918.
<i>Cochin China.</i>										
1262	Cap St. Jacques	♂	840	70	29	49	371	54	"	June, 1918.
1263	"	..	915	75	28	49	406	46	"	"

LIST OF SPECIMENS OF *Hydrophis gracilis*.

No.	Locality.	Sex.	Length.		Scales.		Ventrals.	Caudals.	Collector	Date.
			Total	Tail.	Neck.	Body.				
1102	Kuala Larut	♀	1025	95	22	39	297	..	F. M. S. Mus.	Sept., 1916.
1103	"	♀	965	85	20	35	296	..	"	"
1104	"	♂	795	75	21	35	272	38	"	"
1105	"	♀	645	50	21	35	280	..	"	"
1146	"	♂	810	75	21	37	272	33	"	"
1136	Kuala Kurau	♀	965	85	23	41	302	45	"	Aug., 1917.
2786	"	♂	910	80	19	36	262	38	"	Jan., 1918.
2785	"	♀	850	80	20	37	250	38	"	"
3911	Pulau Angsa	♀	890	70	21	37	279	36	"	June, 1918.
3878	Singgora	♂	750	60	19	33	282	33	M. A. Smith	July, 1919.



LIST OF SPECIMENS OF *Hydrophis viperina*.

No.	Locality.	Sex	Length.		Scales.		Ventrals	Caudals	Collector.	Date.
			Total	Tail	Neck.	Body				
1380	Koh Pai	♂	735	75	30	45	264	39	C. B. Follett	Dec., 1917.
1381	Hua Hin	♀	685	70	33	47	257	40	S. J. Lambert	May, 1917.
1373	"	♂	650	70	29	43	249	40	Mrs. T. H. Lyle	"
1374	Pran	♂	ad.	45	31	43	243	45	M. A. Smith	July, 1917.
1375	"	♂	495	55	31	43	246	43	"	"
1376	Hua Hin	♂	520	30	29	41	262	43	"	"
1377	"	♂	285		29	41	234	46	"	"
1733	Bangnara	♂			31	46	255		C. J. Aagaard	Sept., 1918.
2715	Koh Kong	♂	yg.		27	41	232	34	M. A. Smith	Dec., 1918.
2716	"	♂	ad.		27	37	181	44	"	July, 1919.
3859	Singgora	♂	hf. gr.		31	45	250		"	"
3860	"	♂	"		33	45	238		"	"
3861	"	♂	"		29	44	248		"	"
3862	"	♂	"		33	45	226		"	"
3863	"	♂	"		29	45	235	45	"	"
3864	"	♂	620	65	29	45	235		"	"
3889	Hua Hin	♀	810	85	31	45	250	41	S. J. Lambert	June, 1919.
1378	Cap St. Jacques	♂	yg.		31	45	230		M. A. Smith	June, 1918.
1379	"	♂	435	45	34	50	246	40	"	"
	"	♂			33	49	244	44	"	"

LIST OF SPECIMENS OF *Hydrophis jerdonii*.

No.	Locality.	Sex.	Length.		Scales.		Ventrals.	Caudals.	Collector.	Date.
			Total	Tail	Neck.	Body				
3801	Singgora	♀	460	47	17	21	228	34	F. G. Gorton	1918.
3802	"	♀	390	40	17	21	234	38	"	"
3870	"	♂	905	100	17	21	236	40	M. A. Smith	July, 1919.



LIST OF SPECIMENS OF *Thalassophis anomalus*.

No.	Locality.	Sex.	Length.			Scales.		Ventrals.	Caudals.	Collector.	Date.
			Total.	Tail.		Neck.	Body.				
1382	Chantabun	..	750	90		30	33	229	40	M. A. Smith	March, 1916.
1383	"	♂	810	90		29	33	256	42	"	Sept., 1916.
1386	"	♀	755	85		30	33	242	40	"	Aug., 1916.
1385	Hua Hin	..	yg. ad.			29	33	249	38	Mrs. T. H. Lyle	May, 1917.
1384	Ban Yao	♂	ad.			27	31	218	42	Capt. Petersen	Sept., 1917.
1387	Chantabun	..	370	40		29	33	242	35	M. A. Smith	July, 1916.
1390	Ban Yao	♀	ad.			29	35	242	42	Capt. Petersen	Aug., 1917.
1389	Chantabun	♂	750	80		28	34	248	37	M. A. Smith	" 1916.
1388	"	♀	785	75		30	35	..	..	"	"
2851	Bangpakong	♀	yg. ad.			29	33	234	40	"	Feb., 1917.
2871	Chantabun	♂	745	85		28	33	..	..	"	Sept., 1916.
2866	"	♂	775	80		29	33	..	..	"	Aug., 1916.
	"	..	760	85		30	33	251	..	"	March, 1916.
	"	♀	785	75		30	35	..	..	"	"

LIST OF SPECIMENS OF *Thalassophis annandalei*.

No.	Locality.	Sex	Length.		Scales.		Ventrals.	Caudals.	Collector.	Date.
			Total.	Tail.	Neck.	Body.				
1194	Cap St. Jacques	♀	450	60	68	83	320	60	M. A. Smith	June, 1918.
1195	"	♀	645	80	73	89	352	70	"	"
1196	"	♂	695	95	67	78	346	..	"	"
1197	"	♂	ad.		65	82	345	70	"	"
1198	"	♀	785	95	73	83	342	70	"	"
1199	"	♂	hf. gr.		73	91	368	70	"	"
1200	"	♂	"		62	74	368	73	"	"
3888	Singgora	♂	380	50	68	82	358	66	"	July, 1919.



LIST OF SPECIMENS OF *Enhydrina valakadyn*.

No.	Locality.	Sex	Length.		Scales.		Ventrals.	Caudals.	Collector.	Date.
			Total.	Tail.	Neck.	Body.				
2042	Meklong	♂	imm.		46	58	276	54	M. A. Smith	June, 1917.
2043	"	♂	ad.		46	58	292		"	" 1918.
2046	"	♂	imm.		43	53	236		"	Jan., 1917.
2045	"	♂	900	120	42	52	272	49	"	" 1913.
2047	"	♂	yg.		48	58	287		"	July, 1918.
2049	Bandon	♂	775	85	52	60	264		"	"
2051	"	♂	imm.		45	54	272	50	"	Oct., 1918.
2064	"	♂	"		48	57	243	42	"	"
2065	"	♂	"		48	57	272	53	"	"
2066	"	♂	"		45	57	262	46	"	"
2048	Langsuan	♂	760	80	43	53	244	37	"	July, 1918.
	Trenaganu	♂	imm.		42	51	262		"	"
	Koh Kong	♂	ad.		43	54	264	47	"	Dec., 1918.
	"	♂	"		43	51	282		"	"
	"	♂	"		43	53	288	56	"	"
	"	♂	"		43	53	265	48	"	"
2061	Cap St. Jacques	♂	1280	160	51	59	277	41	"	May, 1918.
2062	"	♂	imm.		43	51	260	48	"	"
2063	"	♂	840	100	42	51	264	44	"	"
	"	♂	imm.		49	60	276	46	"	"
	Tachin	♂	1255	155	49	59	248	42	H. C. Andersen	Nov., 1918.
	"	♂	ad.		42	53	262	44	"	"
	"	♂	"		42	55	280	46	"	"
	"	♂	"		42	52	240	38	"	"
	"	♂	"		45	54	261	40	"	"
	"	♂	"		40	49	265	43	"	"
	"	♂	"		47	57	260	38	"	"
	"	♂	"		48	57	262	37	"	"
	"	♂	yg.		44	55	239		"	"
3856	Bandon	♂			44	54	277		M. A. Smith	Dec., 1918.
2052	Penang	♂	760	100	44	57	260	47	F. M. S. Mus.	July, 1919.
2053	Perak	♂	yg.		55	66	297	50	"	April, 1915.
2054	Loudang	♂	790	100	51	59	253	43	"	"
*2055	Perak	♂	imm.		44	53	271	46	"	"
2776	Kuala Kurau	♂	"		48	60	274	48	"	Jan., 1918.
2777	"	♂	"						"	"

\* gravid, with 7, 18, 7 and 2 embryos respectively in the order placed.

LIST OF SPECIMENS OF *Enhydris hardwickii*.

No.	Locality.	Sex.	Length.		Scales.		Ventrals.	Caudals.	Collector.	Date.
			Total.	Tail.	Neck.	Body				
<i>Gulf of Siam.</i>										
1391	Bangnara	♂	565	60	31	36	203	34	C. J. Aagaard	July, 1916.
1392	Koh Lak	♂	620	70	23	27	135	36	M. A. Smith	June, 1917.
1393	Tachin	♂	510	55	29	35	136	37	H. C. Andersen	March, 1915.
1396	G. of Siam	♀	yg.		26	30	149	33	M. A. Smith	1917.
1397	"	♀	ad.		27	31	134	36	"	"
1398	"	♀	yg.		31	35	178	34	"	"
1399	"	♀	"		33	36	188	33	"	"
1400	Bangpakong	♀	655		31	37	176	29	"	"
1401	Hua Hin	♀	yg.	70	23	25	114	33	S. H. Lambert	June, 1917.
1405	Tachin	♀	yg.		25	29	137	33	H. C. Andersen	July, 1917.
1407	Klong Yai	♀	510		31	37	132	36	C. Boden Kloss	Feb., 1917.
2460	Trengganu	♀	685	65	27	32	132	36	M. A. Smith	Dec., 1914.
2461	"	♀	670	75	27	29	136	32	"	Oct., 1918.
2462	Bandon	♀	ad.		27	29	136	32	"	Aug., 1918.
2463	Langsuan	♀	"		28	29	143	33	"	"
2464	"	♀	"		28	31	135	33	"	"
2465	"	♀	"		29	34	157	34	"	"
2466	"	♀	yg. ad.		31	36	157	37	"	"
2659	Tachin	♀	ad.		24	27	131	38	H. C. Andersen	Nov., 1918.
2689	"	♀	650	70	27	27	120	34	"	"
2690	"	♀	ad.		27	30	140	32	"	"
	"	♀	680	80	32	34	141	32	"	"
	Koh Kong	♀	ad.		33	37	184	32	M. A. Smith	Dec., 1918.
	"	♀	"		29	35	181	..	"	"
	"	♀	"		31	36	170	..	"	"
2710	"	♀	500	60	27	31	125	..	"	"
2711	"	♀	ad.		26	31	150	..	"	"
2712	"	♀	590	70	27	29	152	..	"	"
2713	"	♀						..	"	"

LIST OF SPECIMENS OF *Enhydryis hardwickii*—Continued.

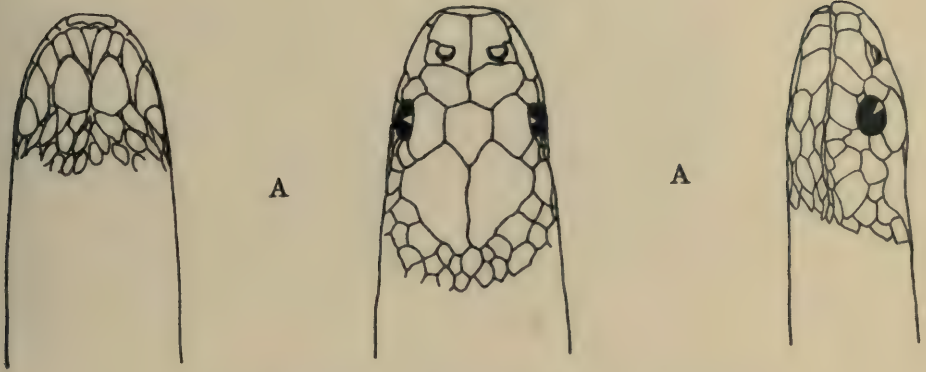
No.	Locality.	Sex.	Length.		Scales.		Ventrals.	Caudals.	Collector.	Date.
			Total.	Tail.	Neck.	Body.				
Gulf of Siam—Continued.										
1404	Tachin	♀	yg.		33	39	187	34	H. C. Andersen	1917.
1409	"	..	"		27	33	149	29	"	"
3881	Singgora	♂	hf. gr.		26	28	136	..	M. A. Smith	July, 1917.
3882	"	♂	"		28	31	138	..	"	"
3883	"	♂	"		35	41	230	..	"	"
3885	"	♂	"		34	38	176	..	"	"
3886	"	♂	"		30	33	148	..	"	"
3879	"	♂	"		29	33	148	..	"	"
Straits of Malacca.										
3923	Pulau Angsa	♀	imm.		29	33	156	..	F. M. S. Mus.	June, 1918.
3925	"	..	"		26	29	144	..	"	"
3926	"	♂	540	65	35	39	178	34	"	"
3927	"	♂	545	65	25	29	136	..	"	"
3929	"	♂	680	70	31	34	156	..	"	"
3931	"	♂	imm.		29	32	156	35	"	"
3933	"	♂	"		33	37	192	37	"	"
3934	"	♂	ad.		25	29	137	37	"	"
3935	"	♂	"		29	37	198	..	"	"
3936	"	♂	565	65	32	35	184	41	"	"
3937	"	♂	610	70	25	28	144	35	"	"
Cochin-China.										
1204	Cap St. Jacques	♂	660	65	25	29	133	34	M. A. Smith	June, 1918.
1205	"	♂	660	70	26	30	126	36	"	"
1206	"	♂	490	50	26	29	136	34	"	"
1207	"	♂	690	70	25	27	134	37	"	"
	"	♂	755	80	25	27	140	34	"	"
	"	♂	ad.		25	29	..	..	"	"
	"	♂	yg.ad.		26	29	143	..	"	"



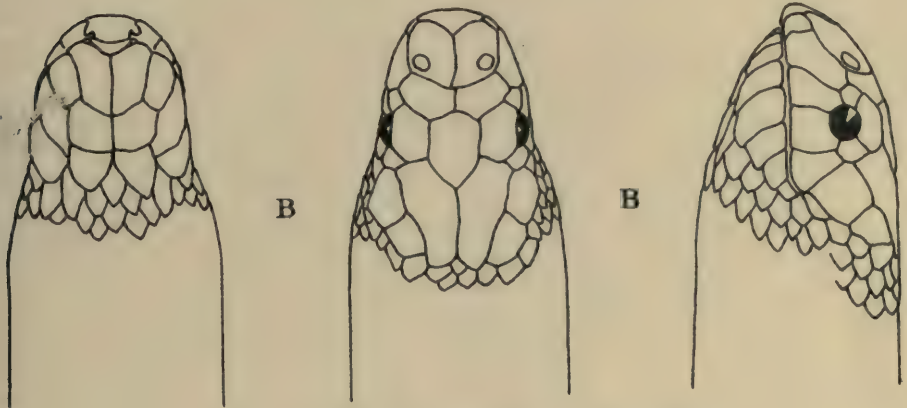
LIST OF SPECIMENS OF *Aipysurus eydouxii*.

No.	Locality.	Sex.	Length.		Scales.		Ventrals.	Caudals.	Collector.	Date.
			Total.	Tail.	Neck.	Body.				
1368	Meklong	♀	540	80	17	17	141	24	J. Kerr	Dec., 1916.
1371	"	♀	215	30	17	17	135	25	M. A. Smith	Feb., 1918.
1372	"	♂	yg. ad.		17	17	140	32	"	"
1369	Hua Hin	♂	430	75	17	17	137	31	W. J. F. Williamson	June, 1916.
1370	"	♂	660	100	17	17	137	31	S. J. Lambert	Dec., 1917.
	"	♂	620	90	17	17	139	29	C. J. Cramer	March, 1917.
2861	Bangpakong	♂	ad.		17	17	129	31	M. A. Smith	Feb., 1919.
2862	"	♀	"		17	17	136	31	"	"
2863	"	♀	"		17	17	139	25	"	"
2864	"	♀	485	80	16	17	131	32	"	"
2865	"	♀	535	70	17	17	140	25	"	"

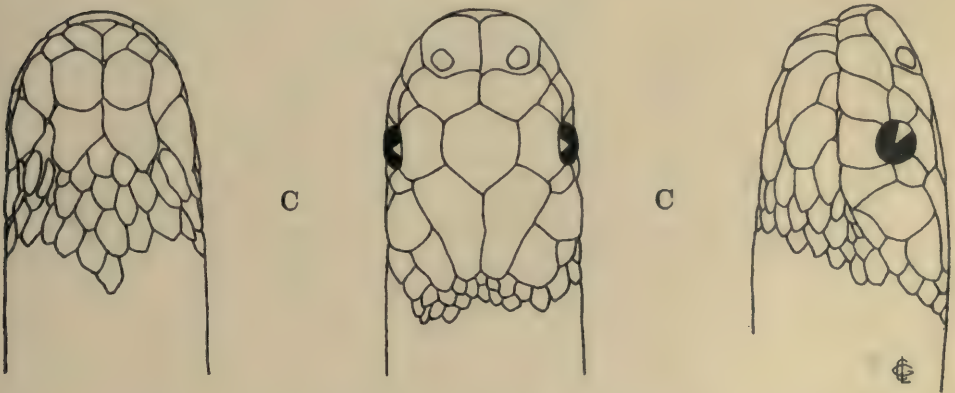




A. *Hydrophis lamberti*. From the type.



B. *Hydrophis klossi*. No. 1189.



C. *Hydrophis consobrinus*. From the type.





## II. ON A COLLECTION OF PLANTS FROM PENINSULAR SIAM.

By H. N. RIDLEY, C.M.G., F.R.S.

The plants dealt with in this paper were collected by the Federated Malay States Museums during a general biological expedition, extending from January to March 1919, to the Islands and West Coast of Peninsular Siam between Lat. 7 and Lat. 11 N.

Hitherto very little collecting has been done in this area though Mr. C. Curtis collected at one time in Puket, Trang and Pangnga while Renong has long been a favourite centre for orchid collectors. North of this region lie the Mergui Archipelago and Tenasserim, the floras of which were extensively collected by Griffith and Helfer.<sup>1</sup>

The typical lowland Malayan flora, that of the dense wet forests of the Malay Peninsula, disappears rapidly as we reach the dryer regions of Kedah, Setul and Perlis, where it is replaced largely by South Burmese and Siamese plants; as we go still further north Malayan plants become again fewer but it is clear that many have contrived to push their way through the dryer regions into the northern parts of Peninsular Siam and into Tenasserim.

Two instances in the present collection are *Pentaphragma begoniaefolia* and *Cyrtandra bicolor*, both of which find their furthest limit here. Well represented in southern Malaya the species of these two genera become more scanty the further north we go until they disappear in this region.

The collection is remarkably strong in *Acanthaceae* with one new genus, and a number of new species.

*Acanthaceae* are comparatively rare in the southern Malay Peninsula becoming more abundant in the dryer northern region. The occurrence so far north of *Thottea* (*Aristolochiaceae*) and of the common southern *Bromheadia palustris* (*Orchidaceae*) in Takuapa, its most northern limit, are important extensions of range.

Among the most interesting novelties are the fine *Capparis Klossii*; *Eloeocarpus tectonaefolius*, only allied to a Javanese species; the stiff-leaved *Canthium trachystyle*; *Vallaris macrantha*, with unusually large leaves and flowers for the genus; the new genus of *Acanthaceae*, *Antheliacanthus*, remarkable for its small almost regular corolla; *Xyris tuberosa*, with its remarkable rhizome of globose joints; and *Carex mapanifolia*, with its dense spikes and broad leaves, allied to *C. Helferi* of Tenasserim and *C. scaposa* of China and Cochin-China.

<sup>1</sup> Dr. A. Keith collected in Bangtaphan, South-western Siam (between the latitudes of Renong and Mergui) in 1890-1, and his specimens form part of the material on which are based Mr. Ridley's botanical papers in the "Journal of the Straits Branch Royal Asiatic Society," No. 59, July 1911, pp. 15-234 [C.B.K].

SOME ACCOUNT OF THE JOURNEY ON WHICH  
THE PLANTS WERE COLLECTED.

*By C. BODEN KLOSS.*

All the islands mentioned below are near that part of the west coast of the Malay Peninsula which is here called Peninsular Siam, i.e., that portion south of the pass across the Isthmus of Kra between the head of the Pakchan Estuary and Chumporn Town and north of the borders of the Malay States of Perlis, Kedah, Perak and Kelantan.

We<sup>2</sup> arrived at Pulau<sup>3</sup> Mohea from Penang on February 1st, 1919, and left on the 3rd.

The north and south islands are each about a square mile in area and between 500 and 800 feet high and are separated from each other by a narrow channel. They lie in about 7° 13' N, some 18 miles west of the coastal island of Telibon which protects the mouth of the Trang River.

From its south-east point west-about to its northern end the south island is steep-to, its western side consisting mainly of high precipitous cliffs: to the east and south it slopes fairly gently and along these shores are several sand beaches with broad reefs in front. The northern island is lower and apparently consists of three hills sloping to the S.E. and joined by sandy necks: all along its south and south-east sides is a sand beach and reefs: the west and north sides are high and steep and there are a couple of rocky coves.

The islands were exceedingly dry and there were no flowers but some fairly big timber, wild bananas, Licualas (?) and Caryota palms. They are largely forested on their eastern sides.

The only water found was in two little soaks on the south island: the western seemed stagnant, the northern was running in the sand. The sea round the islands is beautifully clear and fish were numerous: there is a fine coral reef in the channel. There are no inhabitants but the islands are visited occasionally.

We lay at anchor off the south-east entrance of the channel in 8 fathoms. Vessels should approach no nearer for even in 4 and 5 fathoms there are coral heads which show above water at low tide. A passage through the Strait could be made with care by keeping nearest the south side.

North of Pulau Mohea are some islets—the Pilgrims and Koh Ma. The former are of limestone; the largest, shaped like a boot, has some grass and shrubs. Koh Ma is apparently of sandstone and is largely covered with vegetation.

<sup>2</sup> Mr. H. C. Robinson, Director of Museums and Fisheries, F.M.S., and myself with a party of collectors in the Fisheries launch "Shark."

<sup>3</sup> Pulau (Malay) = Koh (Siamese) = Island.



We passed these on February 3rd on our way north to Koh Pipidon situated in lat.  $7^{\circ} 46' N$  and about 13 miles from the mainland and 20 miles from Junk Seylon to the west. It is the largest of the Vogels, high and wooded, about 4 miles long and two broad. There is a deep bay on the northern side and another, nearly land-locked, in the north-west coast (not shown on the charts). These are separated from each other by a narrow neck of land which connects together the two main portions of the island lying east and west.

South of Pipidon is Koh Pipithall, a long narrow, north and south ridge of limestone with, apparently, a deep fiord near its middle. Many of its summits are rounded but its sides are precipitous and the north extremity is absolutely perpendicular.

We anchored in the north-west end of the south bay of Koh Pipidon (also known as Pulau Bri-bri) in 8 fathoms. The western part of the island is a long ridge of limestone—like Pipithall, very finely coloured white, grey, red, brown, but more clothed with vegetation; the eastern portion is of other formation with more gentle and forested slopes. The two are joined by a neck of low sandy land north of which is the newly-noted bay now in process of being filled up with sand. A steep limestone mass rises to the north of its entrance while there is a small mangrove swamp inland at its south-western head. On the east side of the bay the forest is very thin and patchy.

In south bay beneath the limestone cliffs which form its western side is a flat reef of sand and coral, dry at low tide, which rises fairly steeply: the head of the bay is clean white sand, fairly deep and shelving and on the eastern side a steep-to reef juts out parallel to the limestone cliffs for some distance: anchorage is between these two.

The beach which runs all the way along the south side is of fine sand, interrupted in two or three places by outcrops of rock. East of the first of these lie a few huts which form a temporary settlement of Sain-Sams who visit the island for fishing: 2-300 yds. behind the hamlet is small well of bad water; this was the only water we found on the Island.

In the forest covering the flat neck were numerous giant Collocasias 12—14 ft. high with stems a foot through; the roots are used as food.

The mangrove swamp which is the last indication of part separation of the east and west higher lands is filling up like the north bay where there is now anchorage for small craft only under its north-east point.

The whole island was very dry and except for a little lilac-flower woody plant (*Pseuderanthemum crenulatum*), the only blossoms seen were in the beach vegetation. Cycads, Licualas and other palms are common.

With easterly winds there was a good deal of swell in the south bay but the water was always beautifully clear—shiny pale green over sand and reefs, darker green in greater depths.

On the 6th we proceeded to Puket in Junk Seylon Island and were detained there until the 10th awaiting arrival of a fresh supply of coal from Penang, but the hospitality of Mr. J. F. Johns, H.B.M. Vice-Consul, rendered our stay very pleasant.

On the 10th we left Puket for Pangnga at the head of the Gulf of Junk Seylon. The wind was fresh but sea quite smooth as we steamed north along Palau Panjang a large island in the middle of the Gulf. Tharua on Junk Seylon, which we soon passed, was once a Portuguese settlement. In this part of the gulf there are only two limestone islets, Pipi and Sot, but nearer the head limestone becomes dominant and is wonderfully picturesque northwards of Koh Chanak. It occurs as islets of all shapes and sizes—icebergs, towers, spires, cliffs, serrated ridges, rounded hummocks and overhanging knobs—partially covered with greenery but showing surfaces of white, grey, buff, red, brown purple and slate, while the sea at its bases lies still and deep, dark from shade and reflections.

At the head of the Gulf are wide shallows whence rise Koh Mak, a low island which is a guiding mark for the mouth of the Pangnga River and, further north-east, two limestone blocks between which lies the course to Paklao. We kept on northwards passing twenty yards west of the little Pulau Chetek and, stopping for a minute or two at 2.20 p.m. off the village at the seaward end of Pulau Pungi to engage boats for the journey up river to Pangnga Town, entered the river between tall limestone peaks and anchored at 3.40 p.m. off the customs house. Hereabouts the river runs through mangroves and there are numerous waterways but many great limestone masses tower above the swampy level and relieve and beautify the scene.

On the 11th we left for the town in a dugout, some of which are here very large indeed. It took about an hour and a half to reach the landing place, passing all the while through mangroves above which rose limestone hills like icebergs from a sea. One of these, a mile or more north of the custom house, bears a likeness to an elephant and is called Koh or Kao Chang—I don't know which: the one means "island" and the other "hill" and both would apply.

At the landing steps, where lay several small cargo boats, there is a double row of small shops, mostly Chinese, and the road, rough but partly metalled, runs inland half a mile till it meets another crossing at right angles; the left branch going to Kasom, the right to Pangnga: at the junction is the Governor's house of white-washed stucco. An attempt has been made at an avenue. The road runs first



through rice fields with clumps and lines of *Borassus* palms and then turning towards the left traverses undulating country for a couple of miles before reaching the town, passing various houses and huts with, on the right, a good police barracks in a fine grassed enclosure and a gaol and, on the left, a post and telegraph office.

The present town is almost entirely of wood and palm thatch for the old town beyond it and nearer the river was burnt down about a year ago and the substantial brick walls and cement floors are all that remain—no attempt apparently having been made at rebuilding.

Beyond the old site lies the river—a clear shallow stream in a very broad sandy bed probably full of water in the summer season. The further side is fringed with a tall feather-like bamboo concealing houses and gardens and beyond rises a lofty precipitous range of limestone which is less regularly duplicated on a smaller scale on the near side of the stream. Between these two the main road runs on through fruit orchards and rice fields (divided into unusually small units) to Takuapa. Where the town street, which is only a branch, joins it stands a wat or monastery in charming grounds.

The shrine is a very plain building with an iron roof and contained three well gilt images : to the large central one a white elephant is offering a bottle of beer lifted high in its trunk. The Abbott's house is a pleasant attap building and there is also a good wooden bungalow and a large un-walled shed, while scattered about in the shade are sitting-platforms. Shady trees, red acalyphas, slender areca palms and grass lawns make a pretty foreground to the limestone cliffs which shelter the spot. The Abbott came to talk with us and sent us glasses of tea : there are too few Siamese in the town (the population of which is largely Chinese) to supply sufficient novices to keep the wat in proper condition : many sick people were refuging with him (influenza).

Though perhaps I expected rather more after reading Warington Smyth's description<sup>4</sup> this is certainly a most charming place, especially the pretty and restful wat. One perhaps looked to find the cliff's rather more dominant ; but though they are very beautiful and striking they do not overshadow the town.

Fish, vegetables and fruit were for sale and one or two Indian cloth-merchants had shops : there is now no rest-house. On the road ply two-seated gharries drawn by sturdy little Bandon ponies in excellent condition wearing well-padded collars and saddles.

We got back to the launch at 2.30 p.m., coming down at dead low tide with many sand and mud banks exposed along the edge of the mangroves : in the fairway there are rocks and heavy snags at one or two places so if small

<sup>4</sup> Vide *Five Years in Siam*, Vol. II, p. 15 (1898). In this book the author recounts his experiences while travelling between Trang and Chumporn—the area dealt with in this note (Vol. I, p. 314—II, p. 33).



vessels attempted to proceed above the Chapsi (or customs house) they should do so with great care and local pilotage. At the landing place is a small wharf and a stockyard : at the customs house is also a small wharf and a dozen houses. Plenty of water was to be had nearby from wells.

We left at sunrise, the early rays tinging with beautiful colours the limestone hills to westwards some of which come sheer down into the river. Coming out of the river mouth Pulau Pungi, seen end on, looked like a huge thumb sticking out of the water. Behind it is a fiord-like channel between limestone cliffs which leads to Kasom but the usual way is more to the westward along the mangroves as runs the route to Pangnga to the east. As we turned west into Pakra or Pak Phra Strait between Junk Seylon and the mainland we got our last view of the weird shapes of Koh Chanuk and the adjacent islets. Some of them have been embraced by low expansions of land and are now part of the Peninsula. The softer hilly scenery of the Strait is pretty—forest, green and yellow grass and brown burnt patches. Most of the bays along the shores are shallow and in some of them are stretches of large trees growing in the sea (? *Sonneratea* sp.). There are many fish traps with their attendant wings of stakes.

At the point where the road and telegraph line from Puket reach the shore there are some houses and a large sala (rest house) : also here and there along the shores of the strait are solitary, or little collections of, houses : there are a few coco-palms. A mile or two from the western mouth of the straits we stopped to get a pilot off a pretty little peninsula with a police station and some shops beneath tall Casuarinas and Barringtonia trees and a fleet of boats anchored behind it.

We might have done without the pilot as the shoals at the mouth could be distinguished though the tide was high : the northern bar was indicated by the breakers and the southern, which is outside and overlaps, it, was to be located by its colour. The shores of the exit are low and sandy and lined with Casuarinas and thereafter, until the hills forming the entrance to Klong Bagatae or Tung Pran in Takuatung were reached, we steamed in beautiful calm blue water along a practically unbroken sand beach fringed with Casuarinas and backed with forest ; at intervals passing houses or hamlets with boats drawn up before them on the shore.

Lem<sup>5</sup> Thom Tjob (Lat. 8° 33' N.) the western extremity of the long point sheltering Klong Bagatae, is 500 ft. high and covered with wind-swept forest: a reef extends outwards from the lower northern point. On the opposite side of the Klong (river), Lem Lajan to the eastward is hilly with many rocks at its foot but thence sand and Casuarinas run southward to Ban<sup>6</sup> Tapmo. We steamed in beyond the last to look for a good collecting shore but everywhere

higher up the inlet were mangroves and sand or mud exposed shoals apparently blocking up much of the shallow head : so we turned back and anchored in 5 fathoms a mile and a half within the western cape near a little beach and some coco-palms. We had a few visitors—Malay-speaking Sam Sams.

In the afternoon I walked to Lem Lajan which is on the boundary between Takuatung, in which we were, and Takuapa to the north. It lies about  $3\frac{1}{2}$  miles north of Ban Tapmo over firm sand or short dry grass among the Casuarinas. The forest behind shaded rather thorny undergrowth : many of the trees bore orchids but their flowering season was over except for one pale crimson species. Adjoining the hilly country south of Lem Lajan is a big sandy lagoon backed by mangroves and the tide was pouring into this along a channel through the beach : a reef with rocks borders the shore.

The western point is a low hill covered with open forest : flowers were few, the most conspicuous being a pale pinkish-white one spotted with crimson, borne by a plant 2-4 ft. high (*Cystacanthus pulcherrimus*). Fan palms and Licualas were common and several species of orchids were numerous above the shore rocks, but all flowerless. A swampy depression almost cuts off the point and seawards there is a curious mud and sand lagoon surrounded by mangroves and littoral vegetation. Eastwards on the mainland hills rise to about 3,000 ft. and these come down to the sea at Lem Lajan and northwards.

Traps with lines of stakes (Malay *blat* and *kelong*) seem to be the only form of fishing practiced. The people of the village, which is an extensive one, kept to themselves.

We left early in the morning of the 16th February.

There was little to be distinguished for some time as we stood well off to clear the reefs. Approaching the secondary or middle entrance to Takuapa Inlet, Pak Kruen, its southern side was seen to be slightly hilly and in part grass grown. Inland, more or less easterly, a fine conical hill or small mountain stood out well. The island north of Pak Kruen, Koh Pra Tung, is quite low and flat with Casuarinas along its seaward beach. Koh Gah, the northernmost of the islands forming Takuapa Inlet is separated from the last by a very narrow entrance where the water showed pale green and is high and hilly with long beaches divided from each other by combs of rock : the shore is backed by Casuarinas and in a few places are houses or little hamlets : the northern point, Takuapa, or Kopah, Head (Lat.  $9^{\circ} 16'$  N.) is rocky and bordered by a reef. On the mainland opposite are small forested knolls coming down to the sea and then a long low stretch with Casuarinas and a few houses : south of this is a wide inlet and south again the whole Strait seems edged with mangroves. There are many hills and ranges inland, some of those visible being perhaps 3 to 4,000 ft. high, as is one near the sea with a good many sloping rock faces on its south-west side. Within the north



point of Koh Gah is a fine sand beach with some flat grass land and Casuarinas behind, a mangrove swamp and some dense scrub. A mile or two farther south, concealed by mangroves, lay a small Chinese village in a bight between hills whence comes an excellent stream of good water in a rocky bed. The hills above are covered with penetrable forest in which meander paths connecting oil trees which after tapping are caulked with bundles of soft bark jammed into the holes. Here in the hills are some very pretty rocky water-holes in the bed of the stream: very few plants were in flower. Near the mouth of the stream were two or three houses belonging to Chinamen who have married Siamese women: they have good vegetable gardens, areca palms and pepper plots.

On the 17th we moved up channel and anchored off the northernmost little hillock on Koh Pra Tung, passing on the way the small exit which seemed quite clear and without breakers though there were rollers across the mouth. There is a large space in the interior covered with *Melaleuca* trees. On the mainland opposite much the same feature occurred—a large plain about 10 ft. above high-water level of dry white sand over which grew grass and scattered shrubs, very thick at their bases which were clothed with much moss and immense numbers of orchids. This sand was pure white and crunched exactly like frozen snow when walked on: it looked like snow too. Here occurred *Bromheadia palustris* while several of the bushes bore pretty pale green or white flowers (*Holarpena pauciflora*, *Eugenia zeylanica*, etc.). Elephants were said to be common inland near the mountains.

On the 18th we reached Koh Jam Yai (Big Jam Island) at 1 p.m. and after passing along a rocky shore in depths of 3 fathoms anchored in a shallow bay on the south-east side, south of the summit (700 ft.), where there is a neck of low land behind a considerable reef. Along the north-eastern part of the island runs an almost continuous beach and the land is low, dipping from the central hill which shows faces of rock. Koh Jam Yai (Lat.  $9^{\circ} 30' N.$ ) is about 3 miles long and one wide and about 5 miles from the mainland.

On the 19th I rowed across depths of 3–5 fathoms to the west side of Koh Jam Noi (Little Jam Id.): here are no beaches but patches of sand above rocks: the sides were steep with much large bamboo above them. The Sugar Loaves to the north are pretty little hilly islets with sand spits and Casuarinas: we found depths of 4–7 fathoms between them. On Feb. 19th we reached Delisle Island, about 5 miles long by 2 wide. There are two attractive bays on the west side, in the southern a few houses, but the coast is a foul one with many rocks off-shore: a hill forming the western point of the island separates the bays. Rounding the north point we found sand beaches running for a mile or so towards the eastern point and anchored in 3 fathoms off the first (Lat.  $9^{\circ} 45' N.$ ). A broad flat reef and sandbank bare at low springs made landing difficult



but further down, beyond outcrops of rock, the southern beach seemed cleaner and steeper. The land in our neighbourhood was partly swampy with many rattans and palms, partly dry and sandy. The forest was not lofty. We found no water but it was to be obtained on a point, or island, to the east. The eastern shore of Delisle Id. is low but a hill rises near the south. On the mainland opposite were high hills many of them looking rather bare and these with the smooth green sea and the neighbouring islets made a pretty scene.

We left at 11 a.m. on the 20th Feb. and steering round the west side of Saddle island, where there are attractive *Casuarina*-bordered beaches contrasting with the mangrove-fringed northern shore; passed south of the Lighthouse and east of everything else up to Koh Phi (the lighthouse island) outside Renong River where we anchored. On the south side of the mouth is a village at the foot of a small hill and a little farther on the opposite bank is the Customs station with a well built sea-wall and jetty beneath another little hill. At low tide the sand and mud banks at the river-mouth almost close the entrance. Inland up-stream are mangroves and beyond them a frontal range largely treeless and brown but assuming beautiful tones in the afternoon light : behind all are the peaks of the main range covered with forests.

On the 23rd we paid a visit to Renong town, going up-stream at low tide. Except that it passed two or three little hillocks the river winds among mangroves and much mud and sand were exposed. After a couple of miles we passed a landing place and row of buildings on our right where a number of boats and lighters lay high and dry : soon after we repeatedly found shallow water and had to wait for the rising tide and after about two miles more the stream, branching, became too shallow for our boat so we returned to the landing place, meeting on the way down canoes going up laden with firewood. On shore we got a 2-pony victoria and travelling along a fair road, south of which is a wide plain being worked for tin with dredgers, passed numerous Siamese and Chinese shops and stalls and in about two miles reached the beginning of the town proper. Here were better-class shops, some of brick and stucco, cinemas, post and telegraph office and a good neat gendarmerie barracks. We first called at a substantial brick courthouse on an esplanade with a pavilion and football ground and then went up a low hill to the governor's office, a good and large brick building where we saw an English-speaking official—the governor being absent. Langsuan on the east coast, we learnt, could be reached from here in three days on foot along a track of sorts. Renong town lies long and straggling between the government quarter and the landing stage and is of the usual nondescript peninsular type, largely Chinese, with no particular features ; the most notable being the house of the old Rajah who governed here before the Civil Service System was introduced : it stood in a large tree-

planted space surrounded by walls twenty or more feet high with a large summer-house over the gate : the roads were pretty good and there were some fair residences : in the Chinese stores plenty of tinned provisions were to be had but there was little fruit. The place was dry and dusty, larger than Pangnga but not nearly so picturesque.

A few Europeans of the tin dredging company live and have their repairing shops here and a good deal of Malay is understood.

On the 23rd we crossed the Pakchan estuary to Victoria Point in Burma and anchored off the jetty (Lat. 10° N.). The settlement seems to have grown a little since I was there twenty years ago. Though with its paths, tree-dotted grassy slopes and red-roofed houses it looks attractive from a distance it does not improve with acquaintance—the bazaar is small and squalid with little stock, the paths are of clay and very rough and in the rainy season must be very muddy, and the grass is *lallang*. But from the Wireless Station on the ridge the view over sea, islands and mainland to the mountains is wonderful. A road to Maliwun is metalled for the first eight miles, beyond it has been abandoned and the bridges are down; but it can still be traversed by motor-cycle in the dry season. The place was in charge of a sub-divisional officer and a European Inspector of Police : there were besides a Eurasian preventive officer, an Asiatic doctor in charge of a small hospital, and the staff of the wireless installation. No supplies were to be had but water from wells was good. The surroundings are beautiful : but as a settlement Victoria Point does not compare well even with such a Malayan Sleepy Hollow as Lumut in the Dindings.

On the 24th we took in firewood and a pilot at Renong river and left at 11 a.m. The Pakchan is a fine broad estuary in the lower part, though interrupted by several islands and almost entirely fringed with mangroves : inland the hills rise to some height in places (1,000—2,000 ft.) but they are set far back from the shore and are not impressive: Warington Smyth's reference to its appearance as resembling a northern fiord and having an air of magnitude does not seem justified.<sup>7</sup>

There are hardly any signs of population in the lower part except a few scattered houses and hamlets and a fish-trap here and there : also there are practically no clearings.

We had no difficulty in proceeding as far as Well Hill (23 miles) but there we got onto our first shoal and afterwards we had to sound a good deal—for the pilot proved useless—to find sufficient water for the launch which draws 6-7 ft. Above Well Hill there are more signs of habitation on both Burmese and Siamese banks : mangroves give place to Nipa palms while a belt of flat country begins to border the estuary which now becomes more river-like. We anchored at the landing place of Namchut or Kraburi,

<sup>7</sup> Op cit. II, p. 31.



the principal village of the old state of Kra, now merged in Renong : a couple of miles ahead on the Burmese side we could see the police station and dak bungalow of Marang on a low bare hill.

From the landing stage backed by a few shops a well-kept bridle path ran through rice-fields, which commenced right behind the Nipas, to the Muang or town of Namchut. Less than a mile inland are the office and house of the Ampur<sup>8</sup> a neat police station and some shops and houses whence the track and telegraph wire continue northwards to Chumporn and southwards to Renong. Beyond the village is a wat with several wooden bungalows and a large iron-roofed sala, or resting-place, and on a slight hill above it a temple with thirteen images of Buddha. There is a pretty view from the temple showing the dried-up rice fields, clumps of fruit trees, bamboo, secondary growth and distant hills and forest : and the regular and dense belts of Nipa palms along the river look like raised embankments. We woke next morning to find everything drenched with moisture and shrouded in a dense mist which did not disperse until 8 o'clock.

On the 25th we left the launch at 1.30 p.m. on a rising tide and rowed up stream sounding as we went. Screens of Nipa hid the country inland : at about  $2\frac{1}{2}$  miles we passed Marang dak bungalow on its bare hill and about 2 miles farther up came to the first clear view on the west side—steep banks of earth with the ground running back sharply and level, covered with rice or grass. Above Marang houses become more numerous but many of them are hidden by the Nipas. At about five miles we came to Mamoh on the Siamese bank and from thereon the view became more open over rice fields with houses, low characteristic barns, clumps of trees, palms, bamboos and partially forested low hills. At about  $7\frac{1}{2}$  miles we reached a substantial landing stage and found a bungalow a hundred yards inshore and also the termination of a good broad earth road coming in from the N.E. This place was Tapli : a village lay half a mile farther up stream and after interviewing the Phu-yai-ban (headman) we set off on our return journey, arriving at the launch at 8 p.m.

On Feb. 26th we took the launch up river at low tide touching once on a rock in mid-stream : anchored at Mamoh after half an hour's journey. From here a track runs to Tapli in about 40 minutes through small forest, scrub, fenced-in houses and gardens. On both sides of the river this district is fairly populated and must produce a good deal of rice : it owns elephants and many buffaloes.

A track southwards runs through ricefields and land enclosed by bamboo fences, barbed wire and euphorbia hedges. There is a modest wat on a small hill. The country, all under rice where irrigable, was now covered with brown and tawny stubble pleasantly contrasting with the

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<sup>8</sup> District Officer.



palms, fruit trees, bamboos and patches of scrub and jungle dotted about : in the distance were hills partly forest, partly scrub-covered. Numerous and large herds of buffaloes made rambling about nervous work for a solitary white man. Mamoh contains several Chinese shops. Between 3 and 8 a.m. in the morning a dense shroud of mist always lay over the country.

On March 1st we sent our men and baggage up to Tapli in a small cargo boat. The Lord Lieutenant of the Monthon (Puket) was expected and Mamoh had been making a landing-place for his use : unfortunately it did not extend out to low tide level but ended in mud two feet deep. The Lord-Lieutenant did not go ashore at Mamoh.

The journey from Mamoh to Tapli takes longer by water than by land, but at high tide it is a pretty one as the ricefields come right to the edges of the banks in places. Tapli is the name of the landing place : the village beyond is called Ban Wang Tapoh<sup>9</sup>. A fair-sized bridge was being built over the stream along which it lies. (Klong Wang).

The view from Tapli was very fine—westward across the river lay ricefields with a few scattered houses and fruit trees with low hills beyond : northwards the river winds among flat ricefields coming from low hills many miles away with beyond them a mountain range of about 2,000 ft. running S.E. & N.W. Clumps of trees palms and bamboos diversified the rice lands and in the evening with the low light shining on the river and the hills a glorious deep grey-blue or purple the vista was exquisite.

The hills beyond the bungalow were covered with trees and much bamboo and the undergrowth was very light. Every morning the heavy white mist lay over the river valley : the daily rise and fall of the stream was still considerable (8-10 ft.).

Having at length hired eleven elephants for our equipment (the local animals carry a ridiculously small load) I left Tapli on foot at 10.20 a.m. on March 10th after seeing the first lot of our baggage well away. For the first five kilometres to Pakchan village the trans-peninsular road-to-be ran north through scrub and ricefields fallow under grass. At the village which is the last for many miles was a police station and a long bridge over a broad stream between high banks—the Klong In Song which the road follows, a tributary of the Pakchan rising in the Central range not far from the sources of the Klong Tasan, on the eastern side of the divide, which runs to the Gulf of Siam south of Chumporn.

Thence the road with the telegraph line passes through uninteresting scrub, first eastwards, then south and again east until it reaches the main range which is covered with evergreen forest. The boundary between Renong and Chumporn is 18 kilometres from Wang Tapoh : the pass by which the road proceeds is low—only about two hundred

<sup>9</sup> Ban or Bang = House or Village.

and fifty ft.—and Tasan our next stopping place, lies at the eastern foot of the hills  $2\frac{1}{4}$  kilometres farther on.

Tasan is not a village but only the station of the engineer of the Railway Department who is in charge of road construction. The latter is at present of earth only and is impassible in the wet season : the bridges are all of rough wood and there is a considerable amount of cutting and embankment : after the first two hours from Tapli there is a good deal of water (the Klong In Song) along or across the track.

Tasan lies in a basin into which the elephant track, following quite a different route from the road, enters from the south-west. The house of the Engineer, Signor Giaccone; his office, clerks quarters, coolie lines and a vegetable garden on the flat, make up the settlement. The elephants took about 6 hours on the journey, I and my boy  $3\frac{3}{4}$  hours. We temporarily unloaded into an old shed and I spent the night with the very hospitable engineer. Next day I set up the tents and made camp beneath some trees near the station between the Klong Tasan and a little tributary of good water and we moved the luggage into it. Deer flies were troublesome and in the evening a huge species of mosquito was active. Seven elephants were sent back for the remaining baggage for which shelters were ready and which arrived next day with Robinson.

The engineer and his household were all ill with fever from which he had already lost three servants. Tigers also were bad and had recently taken from a stable within 30 yards of the house a pony and a cow. As a collecting locality, however, the place looked promising though the walk from Tapli was very uninteresting while the hard open road and hot sun had been rather trying.

At Tasan we had excellent dry weather but hot to us—the shade temperature one afternoon being  $95^{\circ}$ , though generally it was about  $92^{\circ}$  : at daybreak it was about  $68^{\circ}$  ; but once when it fell to  $65^{\circ}$  the night seemed very cold. In the neighbourhood the country is undulating and nowhere steep : walking in the valleys is easy. There was a great deal of bamboo in the forest which, fairly dense on the flat, was sufficiently open to allow moving about with ease on the hill tops ; much of this bamboo was fruiting.

There was no great abundance of plants in flower nor were there many orchids : blossom was commonest on bushes and climbers and on a few inconspicuous little plants. Clear-water streams were numerous across the tracks and in damp spots leeches were troublesome while bush-ticks abounded everywhere. The camp was a pleasant one owing to its dryness and the absence of mosquitoes ; but several of our men had short attacks of fever. Elephants frequently passed through Tasan and a few Siamese went to and fro, but there was no cart traffic.

Twelve elephants having arrived from Chumporn, on the 28th March we saw a start made with loading-up and



ourselves set off at 7.30 a.m. The road led through forest (Tamaila 9 kms.) and crossed a number of streams and dry gullies : at 20 kms. it passed near the end of a long limestone hill—the first met with, though later other isolated ones cropped up in the plains. Beyond this one got out of the hills, and bamboo and other scrubs became more frequent on the flat. At 11.07 a.m. came Sep Yuan (24 kms.) where stood a road-overseer's house on the north bank of the Klong (River) Tasan which flows into Chumporn Bay though the town itself is on another river, the Klong Kapao, which has a common estuary with the Tasan.

Beyond Sep Yuan the road is older, broader and very largely overgrown with short grass—very dry and slippery. Houses, fruit trees, grass land and rice fields border it now all the way to Chumporn : the "ton-ta" palm (*Borassus*) was numerous in the paddy lands ; coco and areca palms and bamboo lined the road. The houses were of negative character without distinctive features. Soon after midday I had had enough : it was now very hot in the sunlit road (95° in the shade) though the earlier hours had happily been cloudy : the railway bridge over the Klong Kapao was a welcome sight and ten minutes later I reached the Chumporn Resthouse (35 kms. = 22 miles) at 1.50 p.m. Robinson arrived at 4 p.m. The walk along the hard hot road gave both of us very sore feet.

Of Chumporn town not much need be said : it is one of the places where railway travellers to and from Bangkok have to spend a night (Lat. 10° 30' N.).

It consists in the main of one long street of shops containing tin and iron ware, cotton goods, lamps, food ; a gaol with a galvanised iron stockade, a new government office—a long wooden building on piles facing the less ambitious old one, post and telegraph office and official's houses. A holiday of 19 days, general at this period of the hot dry season, was taking its course.

On the 30th, thanks to the kindness of the Governor, we made a trip down river in a motorboat starting from the boat-house of the royal rest-house. The river is pretty, its clear deep green water running between high steep banks backed by bamboos, palms and fruit trees with houses at intervals. Nearer the sea the shores fall away and Nipa palms and mangroves take the place of other trees.

In an hour and a half we reached a large fishing village at the mouth ; a slack period was on and preparations were being made for the fishing season : boats were being repaired, screens made, nets mended. In the busy season the population is probably a couple of thousand—mostly Chinese. The boats, viking-like craft, have a high straight stem, two rudders, raking stern and one very raking mast.

There is a bazaar, a good customs house, small police-station and a lighthouse on an island. The shores of the estuary are generally low.



On the 31st March, all our baggage having arrived, we went by train northwards to Koh Lak, or Prachuap Kirikan, in S.W. Siam and in that state we collected for three weeks but the country was so dry and flowerless that no botanical material was obtained.

I had the assistance of a native collector at Mamoh, Tapli and Tasan and his statements as to the size and nature of the plant from which he obtained his specimens may occasionally be unreliable : colours, however, being noted from the fresh specimens are correct.

This account is very superficial : it is written merely to give an idea of the localities visited and worked and does not attempt to deal with the flora or fauna of those places. The latter will be recorded in other papers : in this 380 plants are dealt with, of which 59 species or varieties are described as new.

Apparently what Mr. Ridley means in this report by "Malay Peninsula" is not the whole of the Malay Peninsula, which extends northwards as far as the head of the Gulf of Siam (Lat. 13° 30' N.) ; but only the southern portion below Lat. 7° N., i.e., practically the Malay States : but exclusive of the Malay district of Perlis and inclusive of the Siamese State of "Patani."

The northern limit of the true Malaysian flora, which covers the southern half of the Malay Peninsula, Sumatra, Borneo and—to a less extent—Java, and of which the continental section may be called Malayan, seems to be a line joining the towns of Alor Star (in Kedah) and Singgora (at the entrance to the Inland Sea).

Botanical features confirm what geological investigations indicate—that this boundary was the coast line of what was once an island but what has since become the southern half of the Malay Peninsula.<sup>10</sup>

I would call this Alor Star—Singgora line a major transverse break in the Malay Peninsula and am inclined to think that there is another between Bandon and Pangnga, and perhaps Bandon and Trang.

The pass across the Isthmus of Kra, between Pakchan and Chumporn, to which so much attention has been given, is a mere dip in the mountain range there and seems to be structurally and biologically of very little importance.

Mr. Ridley elsewhere calls the flora of Peninsular Siam the "Tenasserim Flora" and the choice of the name seems a reasonable one ; for though the area in which it occurs is politically Siam yet the plants of a great part of that State are much the same as those of Tenasserim and the flora of the latter region was by a long period the first to be investigated and known.

<sup>10</sup> Scrivenor, Journ. Straits Branch Roy. Asiat. Soc. No. 59, July 1911, "The Geological Structure of the Malay Peninsula," pp. 1-13 (vide pp. 2, 8, 9.).

Ridley, tom. cit., "The Flora of Lower Siam," pp. 15-26 (vide pp. 15, 16.); id. ib., "A Botanical Expedition to Lower Siam," pp. 27-60 (vide pp. 27, 29, 30, 55, 56, 59, 60).

Between the Malayan and Tenasserimese floras there must be a transition zone, or area where the two floras overlap and intermingle, though the zone is probably not so broad as the zoological one between Indo-Chinese and Malaysian animals since the latter are more adventurous than plants.

When travelling between Penang and Bangkok by railway I have been struck more than once by the apparant (for I am no botanist) marked difference in the vegetation north and south of the Bandon River ; and it may be that as the Malayan flora extends practically without adulteration north to about Singgora so does the pure Tenasserimese flora stretch southwards to Junk Seylon : and that the area between the Bandon and Singgora breaks constitutes a true intermediate region which has derived its vegetation from both north and south ; though probably for climatic reasons, and possibly because of a less effective break near Bandon, northern plants are more numerous in it.

Perhaps we have, therefore, three floras :—a Tenasserimese, a Malayo-Tenasserimese and a Malayan one : but they all occur in the Malay Peninsula.

Not only is there a north and south difference but there is also one of east and west : this may be superficial and unimportant and due to the presence or absence of certain forms of vegetation rather than to different floras ; but anyone who has travelled or sailed along both shores of the northern part of the Peninsula from Mergui to Penang and from Bangkok to Singgora cannot fail to be struck by the contrast between the more forested west and the more grassy and scrub-covered east.

Though perhaps arising from nature of the land surface these differences should be kept in mind while analysing the flora as long as collections are few and sporadic.

#### DILLENIACEAE.

##### 1. *Delima sarmentosa*, L.

Koh Jam Yai : Tree ; flowers white ; 6628. *Distrib.* India, Malaya. This plant is a scandent shrub.

##### 2. *Dillenia aurea*, Sm.

Tapli : Petals bright lemon-yellow, centre apricot-yellow ; tree ; 6731. *Distrib.* India, Malay Peninsula.

#### ANONACEAE.

##### 3. *Desmos chinensis*, Lour.

Tapli : Fruit green, tipped paler ; small tree, 8 ft. ; 6794. *Distrib.* Cochin-China, Malay Peninsula.

##### 4. *Melodorum rubiginosum*, Hook. fil.

Tapli : Mixed with *Desmos discolor* ; 6794.

##### 5. *Orophea cuneiformis*, King

Tasan : Green, base of petals pink ; 7002. *Distrib.* Malay Peninsula.



**6. *Miliusa filipes*, *sp. nov.***

Branchlets pubescent. Leaves thin, elliptic, bluntly cuspidate, base narrowed, blunt, slightly unequal; nerves about 10 pairs inarching .2 in. from the edge, elevate beneath with few transverse and reticulate nervules, glabrous or sparsely hairy with rather long hairs on petiole and midrib, 5.25 in. long, 1.5 in. wide, petiole very short. Flowers solitary, axillary, on filiform peduncles .75 in. long. Petals ovate, blunt, .4 in. long, .2 in. wide, finely dotted.

Tasan; Greenish-yellow, red at base; 6968. Allied to *M. longipes*, King, of the Malay Peninsula but not glabrous, with very short petioles and larger flower.

**7. *Goniiothalamus undulatus*, *sp. nov.***

Pubescent shrub 5 ft. tall. Leaves thin, oblong, shortly blunt, cuspidate, base cuneate, edge undulate, glabrous except the pubescent midrib beneath; nerves slender, 11 pairs, inarching far from midrib, 7 in. long, 2.75 in. wide; petiole .4 in. long, pubescent. Flowers (all detached) apparently solitary, pedicel .1 in. long. Sepals ovate broad, ribbed, .25 in. long, red, hairy; outer petals thick, coriaceous, ovate-lanceolate .75 to 1 in. long, red hairy; inner petals half as long, broad, triangular hairy.

Tasan; Pale green; 5 ft.; 6836. Undoubtedly near *G. tamirensis*, Pierre of Cochin-China, but much less hairy all over and flowers much larger.

### SCHIZANDRACEAE

**8. *Kadsura Roxburghiana*, Arn.**

Tasan: Fruit green to scarlet; 7051. *Distrib.* India.

### CAPPARIDACEAE.

**9. *Capparis Klossii*, *sp. nov.***

Climber. Branches puberulous, armed with short, recurved thorns in pairs. Leaves large, thin, coriaceous, glabrous above; midrib and nerves 7 pairs elevate beneath, pubescent; nerves inarching within the margin, transverse, nervules few, 9 ins. long, 5 in. wide; petiole thick .5 in. long with 2 thorns at base. Raceme terminal, 8 in. long. Flowers numerous, pedicel 1 in. long or less. Bracts lanceolate, spatulate, petioled .5 in. long, .08 in. wide, petiole as long as blade between a pair of deflexed hooks. Sepals rounded coriaceous, .4 in. long. Petals oblong, ovate, clawed, .5 in. long, white. Stamens very numerous 1.25 in. long. Gynophore slender, 2 in. long, ovary ovoid with a short stigmatic point, .1 in. long. Tasan: petals white; climber; 6845.

This striking *Capparis* has the largest leaves of any I know from Asia. It is most closely allied to *C. trinervia*, also from this region, but the flowers are not ferruginous and the leaves larger and not clearly 3-nerved as in that species.



10. *Capparis micracantha*, DC.

Tapli : White, 2 petals partly yellow or reddish-brown ;  
 6763 : White, bases of petals yellowish brown ; 2 ft. high ;  
 6737. Pulau Mohea : White, lip crimson ; straggling  
 shrub ; 6527. *Distrib.* Siam, South to Kedah

11. *Crataeva macrocarpa*, Kurz.

Tasan : Stamens purple, petals pale yellow-white ; 6932 :  
 White, stems of petals green ; stamens dull crimson ; tree.  
*Distrib.* Malay Peninsula.

## VIOLACEAE.

12. *Alsodeia Kunstleriana*, var. *latifolia*, var. *nov.*

Leaves broad, elliptic, 7 in. long, 3 in. wide. Tasan ;  
 Greenish yellow ; 3 ft. ; 7028. I take this to be a form of  
*A. Kunsteriana*, King, of the Malay Peninsula but the type  
 form of this has quite narrow lanceolate leaves.

13. *Alsodeia mollis*, Hook. fil.

Nam Chut : Flowers white, stamens yellow ; 6696.  
 Tapli ; white ; 6788. *Distrib.* Tenasserim.

14. *Alsodeia racemosa*, Hook. fil.

Tapli : White ; tree ; 6750. This is based upon a  
 specimen labelled "species violaceae, Nov. 1835" from  
 Griffith's collections in Hooker's herbarium and attributed  
 to Assam where Griffith was collecting at that date, but  
 there is another specimen from Mergui, Griffith, in Wight's  
 collection. It is clear that there is a mistake in the first  
 labelling. The plant is unlike any other species in having  
 racemes of flowers and producing these when the leaves  
 are fallen, at least usually. There are no leaves on the Tapli  
 plant.

## POLYGALACEAE.

15. *Xanthophyllum Affine*, Korth.

Tapli : Fruit green ; tree ; 6729. *Distrib.* India,  
 Malaya.

16. *Xanthophyllum Kingii*, Chodat.

Tapli ; Shrub ; 6776. *Distrib.* Malay Peninsula.  
 Both these specimens in fruit only, but I think rightly  
 identified.

## GUTTIFERAE.

17. *Garcinia* sp.

Tree. Leaves lanceolate acuminate, long, narrowed to  
 base, drying grey, rather thinly coriaceous, midrib pro-  
 minent ; nerves slender, 6 in. long, 2 in. wide, petiole .3 in.  
 long, thick angled. Flowers solitary below leaves, sub-  
 sessile. Sepals ovate, round, .25 in. long. Petals rather  
 longer, round. Fruit ovoid, globose, red, .4 in. through.  
 Stigma of about 20 pustules. Tapli : Fruit dull crimson ;  
 tree ; 6875.

## TERNSTROEMIACEAE.

18. *Ternstroemia penangiana* Wall.

Tasan : White : tree ; 6970. *Distrib.* Malay Peninsula.

19. *Schima Noronhae*, Reinw.

Mainland shores of Takuapa : Yellow to deep orange ; 5 to 8 ft. high ; 6617. *Distrib.* India and Malaya.

I never saw it with yellow flowers, and it is generally at least more than 8 ft. tall.\*

## DIPTEROCARPACEAE.

20. *Dipterocarpus turbinatus*, Gaertn.

Tasan : Base white to salmon, tips yellow ; large tree ; 6858 : Base white, tips crimson ; tree ; 6925. *Distrib.* Burma to north of Malay Peninsula. Fallen corollas only sent. (Malay Name "Krueng.")

21. *Vatica faginea*, Dyer.

Koh Jam Yai off Takuapa : Tree ; buds lilac-green, fruits red ; 6629. *Distrib.* Tenasserim, Siam.

22. *Pachynocarpus Wallichii*, King.

Tapli : Yellow ; tree ; 6748. *Distrib.* Malay Peninsula.

This is a big leaved and big flowered form ; some of the leaves measure 12 ins. long and 5 ins. wide.

## ANCISTROCLADACEAE.

23. *Ancistrocladus Griffithii*, Planch.

Koh Goh : Flowers pale green ; woody climber. *Distrib.* Mergui.

## MALVACEAE.

24. *Hibiscus tiliaceus*, L.

Klong Bagatae : Flowers red to reddish-yellow ; throat deep crimson ; large bush, 20 ft. high ; 6566. Koh Pipidon ; 6544.

25. *Hibiscus macrophyllus*, Roxb.

Tapli : Tree ; hard fruit, silky golden ; 6767. *Distrib.* India to Malay Peninsula.

26. *Thespesia populnea*, Carr.

Koh Pipidon : Flowers yellow to red ; tree ; 6543 and 6550. *Distrib.* Tropical Asia and Africa.

27. *Sida rhombifolia*, L.

Tapli : Yellow ; 2 ft. high ; 6811. *Distrib.* Tropics.

28. *Urena lobata*, L.

Tasan : Deep pink, throat crimson ; 6878. *Distrib.* Tropics.

\* Possibly some confusion of labels had occurred when the specimens were unpacked.—C.B.K.

## STERCULIACEAE.

29. *Sterculia laevis*, Wall.

Tasan : Green ; 6905. *Distrib.* Malay Peninsula.

30. *Sterculia rubiginosa* var. *ensifolia*, Mast.

Nam Chut : Flowers red to yellowish ; 6692. Renong River mouth ; inflorescence pink ; 6649. *Distrib.* Malay Peninsula.

31. *Helicteres hirsuta*, Lour.

Tasan : Carmine pink ; 4 ft. ; 6890 : Pink to crimson, base of upper petals yellowish ; 4 ft. ; 6948. *Distrib.* Siam, North of Malay Peninsula.

## TILIACEAE.

32. *Elaeocarpus tectonaefolius*, *sp. nov.*

Tree : Branches velvety ; Leaves broadly ovate, base cordate, tip rounded, thin-textured above, except the velvety midrib and nerves beneath, nerves 10 pairs and prominent reticulations hairy, 12 in. long, 8 in. wide ; petiole tomentose, 4·5 in. long, deeply grooved above with short, simple or branched processes on the side of the groove. Stipules broadly rounded, oblong, strongly nerved, ·5 in. wide, ·4 in. long, top rounded truncate. Racemes axillary, 4 in. long, tomentose. Flowers rather distant, pedicels, ·5 in. long. Sepals lanceolate-acuminate, ·15 in. long, pubescent. Petals little longer, oblong obtuse, apex fimbriate, hairy. Stamens ; filaments linear, narrow with a tuft of hairs at the top. Ovary pubescent, ellipsoid, cone-shaped, 3-celled, ·1 in. ; style pubescent, longer. Disc undulate lobed, prominent, velvety.

Tapli : Tree ; 6761.

This remarkable plant is only related to Blume's *Elaeocarpus macrophyllus* of Java, resembling it in the large thin leaves and the large stipules. It is quite distinct in the velvety covering, cordate leaves and anthers crowned with short hairs.

## RUTACEAE.

33. *Evodia viticina*, Wall. Cat. 1219.

Koh Pipidon : Flowers white, stamens yellow, sepals and bracts pale yellowish green ; 6558. This is only known from the Tenasserim district. The foliage in these specimens is stiffer and more polished than in the type.

34. *Acronychia Porteri*, Hook. fil.

Tasan : Pale green, centre yellow ; tree ; 7009. *Distrib.* Malay Peninsula.

35. *Micromelum pubescens*, Bl.

Mamoh : Fruit green ; tree ; 6708. *Distrib.* Indo-Malaya.



36. *Clausena excavata*, Burm.

Tapli : Small tree ; flowers greenish, stamens yellow ;  
6818. *Distrib.* India, Malaya.

37. *Clausena hirta*, *sp. nov.*

Shrub : 3 ft. tall, entirely shortly densely hairy. Leaves 22 in. long, leaflets 9 or 10, lowest pair round, ovate, crenulate, 3 in. long, 2 in. wide, upper ones oblique, elliptic, blunt, cuspidate, base cuneate inaequilateral ; nerves 7 or 8 pairs inarching within the edge, 7 in. long, 3 in. wide. All thinly herbaceous, glabrous above and hairy on the nerves beneath, thickly covered with translucent glands and dotted over with larger sparser dark brown ones ; petiolules .05 in. long, hairy. Panicle hairy 8 in. long with branches 1.5 in. long at base and shorter upwards bearing short, few-flowered cymes, 8 or fewer on each. Flowers very shortly pedicelled. Calyx and lobes short, 5. Petals imbricate in a globose mass, .1 in. long, oblong. Stamens 8, filaments short, thick, narrowed at base. Anther larger, thick. Ovary 5-lobed. Style short and thick. Fruit sub-globose, .1 in. long when dry, closely set with large punctate glands.

Tasan : Petals pale green, stamens yellow ; 3 ft. ; 7035.

Allied to *C. heptaphylla*, W. & A., but densely hairy.

## OCHNACEAE.

38. *Ochna grandis*, Ridl.

Delisle Island off Takuapa : Scandent bush 25 ft. high ; yellow, stamens brown ; 6640. *Distrib.* Perlis.

I am not certain whether Pierre's *O. Harmandi* is not the same species and perhaps both are to be referred to *O. Wallichii*, Planchon.

## CHAILLETIACEAE.

39. *Chailletia longipetala*, Turcz.

Tapli : White ; small tree ; 6782 : Petals lilac at tip ; climber ; 6801 (?). *Distrib.* Tenasserim.

## OLACINEAE.

40. *Erythralium scandens*, Bl.

Nam Chut : Flowers yellow ; climber ; 6681. *Distrib.* India, Malay Peninsula.

## CELASTRINEAE.

41. *Euonymus javanicus*, Bl.

Tapli : Tree ; petals green, purplish brown at base ; 6972. *Distrib.* Malay Peninsula and Islands.

42. *Microtropis discolor*, Wall.

Tasan : White ; 2 ft. high ; 6985: White ; 6 ft. high ; 6999 and 6838.

43. *Hippocratea ferruginea*, King, (*Salacia Griffithii*, Laws).

Nam Chut : Flowers white, stamens tipped yellow.  
*Distrib.* Trang, Peninsular Siam.

44. *Salacia flavescens*, Korth.

Delisle Island off Takuapa : Yellow to salmon-red ;  
6939. Tapli : White, stamens yellow ; 6774 (var. *ovalis*).  
*Distrib.* Tenasserim and Malay Peninsula.

45. *Salacia grandiflora*, Kurz.

Nam Chut : Flowers white ; bush ; 6666 : Fruit scarlet ;  
6691.

46. *Salacia latifolia*, Wall.

Koh Pipidon : Flowers dull greenish-yellow, centres  
dark greenish brown ; 6554. *Distrib.* Malay Peninsula.

47. *Salacia viminea*, Wall.

Koh Gah : Flowers greenish yellow ; bush, 6 ft. : 6601.  
*Distrib.* Malay Peninsula.

48. *Salacia verrucosa*, Wight.

Nam Chut : Greenish yellow ; shrub ; 6706. Tasan :  
Yellowish green ; climber ; 6947.

The latter with rather thinner and smaller leaves.  
*Distrib.* Tenasserim, Malay Peninsula and Islands.

49. *Salacia garcinioides* sp. nov.

Shrubby, branches, rather slender. Leaves alternate  
or sub-opposite, elliptic, blunt, cuspidate, coriaceous ; nerves  
inconspicuous, 7 pairs, 4 in. long, 1.75 in. wide, petiole .25  
in. long ; young leaves thinner and more fleshy, drying  
orange. Flowers small in axillary fascicles of 13 or 14 on  
small tubercles with minute persistent ovate bracts.  
Pedicels slender .5 in. long. Sepals very short, rounded,  
ovate. Petals 5, oblong, fleshy, keeled on the back.  
Stamens 3, sunk in the disc. Style very short, hardly pro-  
jecting. Tasan : Yellowish green ; climber ; 6875 (?).

The specimens have much the appearance of a *Garci-  
nia*. The little yellowish flowers in fascicles are not very  
like any other species.

#### RHAMNEAE.

50. *Zizyphus oenoplia*, Mill. var. *ornata*, var. nov.

Climber ; branches and nerves beneath, leaves densely  
bright red, tomentose. Mamoh : climber ; yellowish green ;  
6917. *Distrib.* India, Malay Peninsula to the Islands. The  
pretty form described above was collected in Tenasserim  
by Helfer.

51. *Colubrina asiatica*, Brngn.

Koh Pipidon : Fruit brown ; tree ; 6551.

#### AMPELIDEAE.

52. *Vitis Hookeri*, Laws.

Tasan : Fruit brown ; climber ; 7022 : Greenish yellow ;  
7042. *Distrib.* India.

53. *Vitis Robinsonii*, *sp. nov.*

Stems slender, herbaceous, 4-angled below, young parts hairy, red. Leaves herbaceous, simple, glabrous when adult, oblong-lanceolate, base broad rounded or cordate with round lobes, edge closely toothed, apex acuminate; nerves elevate, keeled and sinuate on the back, 8 pairs, 2-3 in. long, .75-1.25 in. wide; petiole .2 in. long; stipules oblong, tip broadly rounded, .1 in. long. Tendrils rather long, simple; corymbs .3 in. wide, subsessile, many flowered, dense, pubescent. Flowers yellow. Pedicels .15 in. long or much shorter. Calyx cupular with an undulate 4-lobed edge. Petals oblong, blunt, .05 in., yellow tipped red, 4. Style rather long. Tasean : Yellow, petals tipped red externally; stems and calyx red; leaves veined red; climber; 6942.

This pretty vine is allied to *V. discolor*, Dalz. but is pubescent with winged nerves on the leaf backs, closely toothed leaves and sub-sessile inflorescence.

## SAPINDACEAE.

54. *Erioglossum edule*, Bl.

Tapli : White; 6787. *Distrib.* Indo-Malaya.

## STAPHYLEACEAE.

55. *Turpinia martabanica*, Wall.

(Label lost). *Distrib.* Burma.

## ANACARDIACEAE.

56. *Anacardium occidentale*, L.

Koh Gah : Bushy tree; flowers white to pink; 6600 and 6602. *Distrib.* Tropics generally. Native of South America.

57. *Buchanania acuminata*, Turcz.

Klong Bagatae : Flowers white, fruits brownish-red; large bush; 6567. *Distrib.* Tenasserim, Malay Peninsula.

58. *Gluta Tavoyana*, Hook. fil.

Nam Chut : Flower yellowish; calyx crimson; fruit purple-green; shrub, 4 ft.; 6690. *Distrib.* Tenasserim.

This is certainly near *G. elegans* of Penang but the flowers are smaller. The fruit is obliquely round-elliptic, flattened, 1.5 in. long, 1.25 in. wide and about .25 in. through.

59. *Gluta coarctata*, Hook. fil.

Tapli : White tinged with pink at the top, 6809. Tree 40 ft. *Distrib.* Malay Peninsula.

## MELIACEAE.

60. *Sandoricum nervosum*, Bl.

Mamoh : Green; tree; 6701.

61. *Aglaia odoratissima*, Bl.

Tasean : Yellow; large tree; 6898. *Distrib.* Malay Peninsula.



**62. *Aglaia tenuicaulis*, Hiern.**

Tasan : Fruit yellowish brown ; 6979. *Distrib.* Malay Peninsula.

**63. *Amoora racemosa*, *sp. nov.***

Tree 30 ft. tall. Leaves 12 in. long, leaflets 7, elliptic obovate, shortly blunt, acuminate, thinly coriaceous, glabrous ; nerves 9 pairs, rather slender, elevate beneath, 7·5 in. long, 3·5 in. wide, petiolule ·2 in. long, swollen at base. Racemes 2-3 together, very slender up to a foot long, glabrous with flowers ·15 in. apart, scattered. Pedicels ·1 in. long. Flowers globose, white. Sepals 5, round free, ciliate, pubescent on the edge. Corolla ·1 in. long ; lobes imbricate 4, two outer ones coriaceous. Staminal tube round, lobes rounded, anthers on the inner face below the lobes 8, oblong. Ovary small, hairy ; style stout, rather long. Stigma orbicular, flat. Tasan ; calyx green ; centre white ; 7039.

This species approaches the *Aphanamixis* section in its slender inflorescence of scattered flowers, but the flowers are much smaller and pedicelled, the stamens only 8.

## CONNARACEAE.

**64. *Rourea intermedia*, *sp. nov.***

Leaves 4 in. long, rachis slender, puberulous, leaflets over 20, coriaceous pubescent beneath, above shining, oblong, shortly blunt acuminate, base rounded ; nerves about 8 pairs, obscure, reticulations and nervules as conspicuous on both sides, 1—1·5 in. long, ·5 in. wide ; petiolule minute. Flowers not seen. Fruit-spikes 3 in. long, pubescent. Calyx in fruit ·12 in. long, lobes round. Carpels ·5 in. long, upper part recurved, blunt, glabrous. Seed ellipsoid quite covered by aril. (Label missing). This species allied to *R. parallela* has the leaflets narrowed to a blunt point. They are very variable in size and shape, some being almost ovate.

**65. *Connarus paniculatus*, Roxb.**

Nam Chut : Flowers white, stamens tipped yellow ; 6683. *Distrib.* India to Tenasserim.

**66. *Connarus semidecandrus*, Jack.**

Tapli : Fruit green ; bush ; 6775. *Distrib.* India, Malay Peninsula.

**67. *Ellipanthus Helferi*, Hook. fil.**

Tasan : 3 ft. high ; fruit yellow. This species was only known from some flowering specimens collected in Tenasserim or Andamans (locality doubtful) by Helfer. The plant sent by Mr. Kloss is in fruit. The foliage and pubescent branches resemble Helfer's plant and I assume it to be the same, though with a little doubt as I have no flowers of this nor fruit of Helfer's plant. The fruit is in a stout raceme

of 14 capsules, 1 in. long with a stalk .25 in. long, all closely velvety, the body of the capsule .5 in. through, terminating in a short curved and hooked beak.

## LEGUMINOSAE.

68. *Crotalaria saltiana*, Andr.

Tapli : Yellow ; 6793. *Distrib.* Tropical Asia.

69. *Vigna retusa*, Walp.

Klong Bagatae, sea beach : Yellow ; 6584. *Distrib.* Indo-Malaya.

70. *Flemingia congesta*, Roxb.

Tasan : Green, striped dull crimson, lateral petals carmine ; 4 ft. ; 6885. *Distrib.* Indo-Malaya.

71. *Adinobotrys atropurpureus*, Dunn.

Tapli : Dull crimson, hood green in centre near the base ; tree ; 6790. *Distrib.* Malay Peninsula.

72. *Pongamia glabra*, Vent.

Koh Pipidon : Lilac, sepals brownish-crimson ; fruit dull green ; tree ; 6552 and 6553. Delisle Island off Renong ; Mauve white ; fruit greenish brown ; tree ; 6641. The fruit in this specimen is abnormal, apparently attacked by some insect and forming a globose woody 2-celled ball. *Distrib.* Sea coasts, India and Malaya.

73. *Derris uliginosa*, Benth.

Nam Chut : Pinkish-white ; shrub ; 4 ft. ; 6694. *Distrib.* Indo-Malaya, Polynesia.

74. *Derris elliptica*, Benth.

Tapli : White at tip, crimson at base ; bush. Perhaps wild here but often cultivated. "Tuba."

75. *Derris amoena*, Benth.

Delisle Island off Takuapa ; lake to pink ; climber ; 6642 : Crimson to white ; stem twisted 30-40 yards long ; 6648. *Distrib.* Tenasserim, Malay Peninsula.

76. *Derris* sp.

Tasan : climber ; 6846. A very pubescent species but specimens too young.

77. *Sophora tomentosa*, L.

Koh Pipidon : tree ; leaves grey, green on reverse ; 6548. *Distrib.* Tropics generally.

78. *Bauhinia bracteata*, Graham.

Tapli : Greenish yellow ; climber ; 6795. Nam Chut : Yellowish white with crimson veins ; 6661. *Distrib.* Siam to North Malay Peninsula.

79. *Cassia fistula*, L.

Mamoh : Lemon yellow, stalks of stamens green ; 6713. Wild in India, often planted elsewhere.

80. *Albizzia myriophylla*, Benth.

Koh Gah : Bush or climber ; inflorescence yellowish brown ; 6609.

## RHIZOPHOREAE.

81. *Ceriops Roxburghiana*, Arn.

Koh Gah : A bushy tree in mangroves ; green, stamens brownish pink ; 6599. *Distrib.* E. Africa, India, Malaya, Australia.

82. *Carallia lucida*, Kurz.

Nam Chut : Flowers green, stamens brown ; tree ; 6682. *Distrib.* Malay Peninsula.

## COMBRETACEAE.

83. *Combretum Klossii*, *sp. nov.*

Tree : Branches slender, tomentose. Leaves elliptic, subacute or blunt, shining, pubescent, hairy on the nerves beneath 3 in. long, 1·25 in. wide ; nerves 7 pairs, slender, petiole ·25 in. Flowering branches slender, pubescent hairy, in large terminal panicles with leaf-like bracts at base of branches. Cymes scattered remote with a pair of leaf-like branches, ·25 in. long, at base narrow, linear. Flowers ·05 in. wide, white, hairy outside. Ovary sessile, short, hairy. Sepals small lanceolate. Petals lanceolate acute, little longer. Stamens as long. Disc glabrous, lobed.

Koh Pipidon : Flowers white ; tree ; 6556.

Allied to *C. decandrum*, Roxb., but with much more slender sprays of flowers, the flowers being distant and not congested with large floral bracts as in that species.

84. *Combretum extensum*, Roxb.

Pulau Mohea : Petals white, head of stamens brown ; general colour of flower pale greenish yellow ; woody climber ; 6533 and 6528. *Distrib.* India to Malay Peninsula.

85. *Calycopteris floribunda*, Lam.

Koh Pipidon : Tree ; fruit green ; 6553. *Distrib.* India and North Malay Peninsula.

86. *Quisqualis densiflora*, Wall.

Tasan : Flowers red or white ; climber ; 6891. *Distrib.* Moulmein, Malay Peninsula.

87. *Lumnitzera coccinea*, W. & A.

Koh Gah : Tree 30 ft. ; red ; 6587.

## MYRTACEAE.

88. *Eugenia formosa*, Wall.

Tasan : White ; tree ; 6843. Tapli : Pink ; tree ; 6800. *Distrib.* India to Tenasserim.

89. *Eugenia rubida*, *sp. nov.*

Tree : Branchlets above with red flaky bark, slender. Leaves rather thin, coriaceous, oblong lanceolate, base



narrowed blunt, tip shortly blunt, acuminate ; nerves 10 pairs with occasional nearly as prominent intermediate ones, inarching .1 in. from the edge, 5 in. long, 1.75 in. wide ; midrib prominent, petiole .25 in. long, rather thick. Flowers 3 to 4 terminal ; pedicels thick .1 in. long. Calyx funnel-shaped, .4 in. long, lobes .25 in. long, persistent. Petals broad, sub-orbicular, .6 in. long. Stamens very numerous, .5 in. long. Fruit globose, narrowed just below calyx lobes, closely finely ribbed from base, .75 in. through. Tasan : crimson, tipped buff ; tree ; 6906. Tapli : Calyx pink ; stamens tipped buffy ; 6766.

90. *Eugenia acuminatissima*, Kurz.

Tasan : Fruit green ; large tree ; 6900. *Distrib.* South to Malay Peninsula.

91. *Eugenia leptantha*, Wight.

Tapli : Fruit green ; 6740. *Distrib.* Malay Peninsula.

92. *Eugenia zeylanica*, Wight.

Delisle Island off Takuapa : Flowers greenish white ; fruits white ; tree ; 6643. Takuapa Mainland : Flowers greenish white ; 6614. Koh Gah : Flowers greenish white ; tree ; 6588 and 6589. *Distrib.* India, Malay Peninsula and Islands.

All the specimens quoted above are remarkable for their persistent bracts, sub-spathulate at the base of the cymes and to each flower. The flowers are in a very young state, and in the fruiting specimen the bracts are all fallen.

93. *Eugenia punctifolia*, *sp. nov.*

Tree. Leaves thin, sub-coriaceous, elliptic, narrowed gradually to the base, shortly acutely acuminate ; nerves horizontal above, 22 pairs, rather fine with the secondary nervules nearly as prominent, meeting in a nearly straight intramarginal vein close to the edge ; on the underside are scattered pustules on the reticulations, 4.5 in. long, 2 in. wide, upper side dotted with translucent glands, petiole .25 in. long. Cymes in uppermost axils, peduncle 1 in. long, branches .75 in. long. Flowers crowded at summit. Calyx obconic .1 in. long, margin undulate. Petals free, obovate, round, small. Stamens short, hardly .1 in. long. Fruit oblong, globose .12 in. long, sessile with hardly any trace of calyx-lobes. Tapli : White ; tree ; 6799. Mamoh : Greenish white ; tree ; 6704.

In some respects this is allied to *E. oblongifolia*, but the petals are free and not calyprate.

94. *Barringtonia acutangula*, Gaertn.

Nam Chut : Carmine, calyx green ; tree 8 ft. ; 6670. *Distrib.* India, Malay Peninsula.

95. *Careya arborea*, Roxb.

Tasan : Dull greenish-brown, beard blackish ; 6832. *Distrib.* India to North Malay Peninsula.

## MELASTOMACEAE.

96. *Melastoma normale*, Don.

Nam Chut ; 6665. *Distrib.* India and Malaya.

97. *Otanthera bracteata*, Korth.

Tasan : Magenta ; 7050. *Distrib.* Mergui and Malay Islands.

98. *Sonerila ciliata*, *sp. nov.*

Stem woody, angled, and winged, red, scurfy pubescent, 12 in. tall. Leaves membranous, obliquely elliptic lanceolate, base narrowed, edge serrulate, spinulose ; nerves 3 pairs, upper leaves spotted with large white spots with a central dark-coloured pustule, 3-4 in. long, 1·75 in. wide ; petiole ·25 in. long. Young leaves in bud purple, glandular hairy. Flowers not seen. Capsules quite smooth, ·25 in. long, pedicel ·1 in., valves 4, incurved, second on a peduncle ·5 in. long. Tasan : Leaves spotted white ; reverse dull crimson ; 6982.

I do not know any species really like this, the woody angled and winged stem, and quite smooth rounded capsules are very distinct. The leaves are not always spotted and are sub-equal and similar.

99. *Memecylon coeruleum*, Jack.

Pulau Mohea off Trang ; Fruit greenish-pink ; 6536. *Distrib.* India, Malay Peninsula.

100. *Memecylon grande* var. *Merguica*, Clarke.

Tapli : Fruit red ; tree ; 6757. *Distrib.* Tenasserim.

101. *Memecylon edule*, Roxb.

Tasan : White ; 10 ft. ; 6892 : White, stamens violet tipped yellow ; 7047. *Distrib.* Indo-Malaya.

102. *Memecylon garcinioides*, Bl.

Tasan : Blue, dark and light ; stamens tipped yellow ; 6844. *Distrib.* Malay Peninsula and Islands.

103. *Memecylon corticosum*, *sp. nov.*

Branches terete with 4 thin corky wings. Leaves lanceolate, base round, tip long, acuminate, drying pale green ; nerves about 20 pairs, sunk above, prominent but slender beneath, secondary nerves and reticulations visible, 7 in. long, 2 in. wide, petiole hardly ·08 in. long. Flowers small in short fascicled axillary cymes, peduncle ·1 in. long, pedicel as long. Calyx campanulate, ·1 in., truncate. Disc flat rayed. Flowers smaller than in *M. heteropleurum*.

Tasan : Dark crimson ; 7027. Most nearly allied to *M. heteropleurum*, but I think it can hardly be a form of that.

## ONAGRACEAE.

104. *Jussieua exaltata*, Roxb.

Tasan : Lemon-yellow ; 1 foot. *Distrib.* India, Malay Peninsula.



## CUCURBITACEAE.

105. *Gynostemma crenulatum*, *sp. nov.*

Climber, very slender. Stems glabrous, angled and grooved. Tendrils simple, slender. Leaves trifoliate, central leaflets largest, sub-coriaceous, glabrous, elliptic, ovate, blunt edge crenulate with a short spine in each notch ; nerves 5 pairs, elevate beneath, 2-2.5 in. long, 1.5 in. wide ; petiolule .1 in., petiole 1 in. long. Panicles lax, spreading, hairy, about 7 in. long. Flowers (only males seen) minute, pedicels very short. Sepals lanceolate, narrow. Petals lanceolate-acute, rather deeply cut (not elongate cuspidate). Anthers 5, Tasan : Green ; climber ; 6901.

This species is distinct from *G. pedata*, Bl. in the stiffer leaflets, not serrate but with a few long crenulations, in the notch of each a short spinelet. The flowers differ also in the short lanceolate corolla-lobes with only a short point.

## ARALIACEAE.

106. *Heptapleurum venulosum*, Seem.

Koh Jam Yai off Takuapa : Tree ; inflorescence greenish-white ; 6631. *Distrib.* India, Malay Peninsula.

## RUBIACEAE.

107. *Uncaria attenuata*, Korth.

Tasan : White ; stamens tipped brown ; climber ; 7023. *Distrib.* Tenasserim, South to Singapore, Sumatra.

108. *Hedyotis capitellata*, Wall.

Nam Chut : White ; creeper ; 6663. Tasan : Yellowish-white ; climber ; 6893. *Distrib.* Tenasserim, Malay Peninsula, Malay Islands, Yunnan.

109. *Ophiorrhiza hispidula*, Wall. Cat. 6234.

Tasan : Crimson ; 6949 : White ; 4 ft. ; 6896 : Tips white, base dark pink ; 6963. *Distrib.* Tenasserim, Java.

110. *Mussaenda variolosa*, Wall.

Nam Chut : Flowers orange, bracts pale yellow ; 6650. *Distrib.* Lower Burmah to Tenasserim.

111. *Greenia Jackii*, W. & A.

Koh Jam Yai off Takuapa : Tree ; inflorescence pink to brownish green ; 6630. *Distrib.* Tenasserim, Malay Peninsula.

112. *Myrioneuron capitata*, *sp. nov.*

Woody unbranched shrublet 2 ft. tall. Leaves herbaceous, elliptic oblanceolate, glabrous, narrowed to petiole ; nerves 21 to 22 pairs, parallel ascending and connate in an intramarginal nerve, midrib rather stout, 11 in. long, 2.75 in. wide, petiole 1.75 in. long. Stipules narrow, lanceolate, long acuminate, .75 in. long. Head dense compact .5 in. through, terminal on a peduncle 1 in. long. Bracts lanceolate-acuminate as long as the flowers, outer bracts round, broad, .2 in. long. Sepals lanceolate-acuminate. Petals



linear, lanceolate-acuminate shorter. Stamens very small with slender filaments. Style rather stout, deeply bifid into 2 linear blunt lobes from a large fleshy disc. Tasan: White; 2 feet.

Differs in its small compact head and glabrous corolla from the other Indian species.

**113. *Diplospora stylosa*, sp. nov.**

Shrub 6 ft. tall; branches slender, pale glabrous. Leaves thinly coriaceous, sub-herbaceous, lanceolate-acuminate, cuspidate at both ends, nerves 6 pairs fine, elevate beneath, 5.5 in. long, 1.5 in. wide, petiole .25 in. long. Stipules subulate from a broad triangular base, .1 in. long. Flowers small, few on a short axillary raceme, .1 in. long, glutinous, shining. Calyx campanulate, narrowed below the limb with 4 acute triangular teeth. Corolla yellowish, tubular .1 in. long, lobes oblong ovate, acute, nearly as long as the tube, mouth of tube hairy within. Stamens shortly exsert from tube. Style long exsert; stigma deeply bifid into 2 broad lanceolate lobes nearly as long as corolla lobes, long exsert. Fruit ellipsoid narrowed at base and top and crowned with calyx. Tasan: Yellowish-white; 6 ft. tall; 6834. Near *D. Kurzii* but with fewer flowers and different venation.

**114. *Randia fasciculata*, Lam.**

Tasan: bush; white; 6982. Koh Jam Yai off Takuapa; White; 6625. *Distrib.* South to Malay Peninsula.

**115. *Randia parvula*, sp. nov.**

Shrub 5 to 8 feet tall; bark pale, spines .4 in. long, rather stout. Leaves coriaceous, ovate to elliptic lanceolate .5 in. long, 2.5 in. long, .75 in. wide or less, one or two pairs on the short 1-1.5 in. branches, petiole very short; stipules .1 in. long, broad at base with a subulate point, pubescent when young. Flowers 2 on a very short axillary or terminal peduncle with several imbricate, ovate acuminate bracts. Pedicel .1 in. long, glabrous. Calyx .25 in. long, campanulate, hairy with 5 long setaceous points. Corolla tube slender, .5 in. long, curved, lobes oblong acute, .25 in. long. Stamens; anthers acuminate, exsert. Stigma clubbed. Fruit globose, .25 in. through, pubescent, crowned with the persistent calyx-tube. Koh Gah: Thorny bush 5 to 8 feet; white; scented; 6608. Allied to *R. fasciculata* but leaves and flowers much smaller, leaves more coriaceous.

**116. *Randia densiflora*, Benth.**

Tasan: Pale greenish-yellow, almost white; 15 ft.; 6867; yellowish; tree; 6934. *Distrib.* Assam to Singapore and Travancore, Malay Islands, S. China.

**117. *Randia Klossi*, sp. nov.**

Climber, glabrous with pairs of axillary spines, .3 in. long, slightly curved. Leaves thinly coriaceous, elliptic, base rounded or very shortly narrowed, tip rather abruptly acute, 5 in. long, 2 in. wide; nerves 5 pairs usually faint; petiole .3 in. long. Stipules broad, ovate, triangular, keeled

with a strong point. Cymes of 3 or 4 flowers in the axils ; peduncle short, thick ; bracts ovate ; pedicel short and thick. Calyx tubular, funnel-shaped, .25 in. long with very short sub-ovate lobes. Corolla-tube 1.5 in. long, slender, cylindrical, lobes linear oblong .5 in. long by .15 in. wide, pubescent on the upper face just above the mouth. Stamens included except the extreme tips. Style little longer than the corolla-tube, clubbed at tip. Tasean : Pale yellowish white to yellow ; strong scent ; climber ; 6872. Allied to *R. fragrantissima*, Ridl. and *R. Clarkei*, but the leaves are hardly coriaceous.

118. *Gardenia tubifera*, Wall.

Tapli : fruit green ; 6749. *Distrib.* Tenasserim, Malay Peninsula.

119. *Guettarda speciosa*, L.

Koh Pipidon : Flowers white ; tree ; 6557. *Distrib.* Sea shores of Trop. Asia.

120. *Canthium trachystyle*, *sp. nov.*

Glabrous shrub. Leaves coriaceous in distant pairs, lanceolate, base round, tip acuminate ; nerves 4 pairs deeply sunk above prominent beneath, 3 in. long, 1.25 in. wide, petiole .2 in. long. Stipules short, subulate. Racemes axillary and terminal very short, .1 in. with numerous small ovate hairy bracts. Pedicels slender, .15 in. long. Calyx campanulate with short indistinct teeth. Corolla tube very short .15 in. and broad, lobes 5, twice as long, linear-oblong, sub-acute, mouth with a ring of prominent hairs. Style much exsert, in the middle a dense mass of hairs. Stigma large, oblong deeply cut into 2 points. Ovary 2-celled, one ovule in each cell.

Tapli : Bush ; 6760. Very unlike any species known to me in its stiff leaves and long hairy style.

121. *Ixora merguensis*, Hook. fil.

Tapli : Flowers white ; 6772. *Distrib.* Mergui.

122. *Ixora spectabilis*, Wall.

Nam Chut : Inflorescence yellow ; shrub ; 6668. Klong Bagatae : Calyx pink ; fruit white ; 10-12 ft. ; 6562. *Distrib.* Burma, Tenasserim.

123. *Ixora diversifolia*, Wall. Cat.

Klong Bagatae : Flowers white ; carmine at base ; 10 ft. tall ; 6580. Probably only a form of *I. pendula*, Jack *Distrib.* Martaban, Tenasserim, Malay Peninsula.

124. *Ixora stricta*, Roxb. (*I. amoena*, Wall.).

Takuapa Inlet, Mainland : Yellow to deep orange ; 5 to 8 ft. ; 6617 ; small and close-leaved form. Delisle Island, off Takuapa : Yellow to salmon red ; 6639. Pulau Mohea off Trang : Salmon, throat pink ; 6 to 8 ft. ; 6529 ; big leaved form, leaves 7 by 3 in. Klong Bagatae : Salmon to yellow ; 6 to 10 ft. ; 6571. Tasean : Salmon to yellow ; 9 ft. ; 6992. A form with narrow lanceolate leaves, 6 in. long by 1.25 in.



wide, resembling a form of *I. Lobbii*; but the flowers of *I. amoena*. Koh Jam Yai off Takuapa; Apricot yellow to red; 6-10 ft.; 6627. *I. stricta* is a common, conspicuous and very variable plant. It occurs from India, South all over the Malay Peninsula.

**125. *Ixora congesta*, Roxb.**

Tapli: 6 ft.; Flowers red, salmon scarlet to apricot yellow; 6821. Nam Chut: Red; 6670. *Distrib.* Tenasserim, Malay Peninsula.

**126. *Ixora nigricans*, Br.**

Tapli: bush, 5 ft. *Distrib.* India, Malay Peninsula.

**127. *Ixora opaca*, Br.**

Nam Chut: Flowers pinkish-white. *Distrib.* Martaban, Siam, Penang.

**128. *Coffea merguensis*, *sp. nov.***

Bush with slender twigs. Leaves at end of twigs few, lanceolate, narrowed to both ends, acuminate blunt, thin coriaceous; nerves 5 to 6 pairs, 2 in. long, .75 in. wide, petiole .15 in. stipules short, forming a tube, blunt. Flowers few in the terminal axils. Bract lanceolate, longer than the calyx. Calyx very short campanulate with 5 minute teeth. Corolla white, tube slender, nearly .5 in. long, glabrous inside, lobes lanceolate acute, nearly as long as tube. Stamens; anthers very long, linear, half exsert.

Tapli: White; bush; 6806. *Distrib.* Tenasserim (Helfer); Mergui (Griffith). This plant was confused by Hooker with *C. fragrans*, Wallich, a very distinct plant from Sylhet with much larger leaves and flowers: it is nearer *C. travancorica*, W. & A., which occurs in South India.

**129. *Morinda citrifolia*, L.**

Pulau Mohea off Trang: Flowers white; 6538. Wild and cultivated all over Eastern Asia.

**130. *Morinda elliptica*, Ridl.**

Nam Chut: White; 6671. Pulau Mohea off Trang: Flowers white; tree, 30 to 40 ft.; 6530.

**131. *Rennellia speciosa*, Hook. fil.**

Tapli: Pale lilac, yellowish at centre; 5 ft. tall; 6770. Nam Chut: Pale violet to violet; shrub; 6660 and 6662. Tasan: Pale violet; 15 ft. *Distrib.* Malay Peninsula.

**132. *Prismatomeris malayana*, Ridl.**

Delisle Island off Takuapa: White; scented; 12 ft.; 6647. *Distrib.* Malay Peninsula.

**133. *Prismatomeris Griffithii*, *sp. nov.***

Tree: Branches slender, pale. Leaves sub-coriaceous thin elliptic, shortly blunt acuminate, under side of leaf pale yellowish when dry; nerves 6 pairs, pale, distinct, 3.5 in. long, 1.75 in. wide, petiole .1 in. Stipules very inconspicuous caducous. Flowers in falsely terminal cymes of 3, peduncles very short, .05 in. Calyx campanulate, funnel-



shaped .1 in. long with 5 minute teeth. Corolla tube .5 in. long, glabrous within lobes linear undulate, a strong rib outside and 2 inside, .5 in. long. Stamens 5 in a slightly dilate portion of tube below the mouth linear, apiculate. Style long exsert half as long as corolla-lobes. Fruit unripe, globose, narrowed to the persistent calyx. Tasan : White ; tree ; 6940. Mergui (Griffith). This together with *P. malayana* as well as probably several other species was confused by Hooker in the Flora of British India with the very distinct *P. albidiflora*, Thw., of Ceylon. *P. Griffithii* differs from the Malay Peninsula, *P. malayana*, in the very short petiole and pedicels, and much longer calyx.

**134. *Psychotria sarmentosa*, Bl.**

Tasan : Greenish white ; climber ; 6977. *Distrib.* India, Malay Peninsula.

**135. *Psychotria Jackii*, Hook. fil.**

Tasan : White ; 2 ft. ; 6871. *Distrib.* Malay Peninsula.

**136. *Psychotria auriculata*, *sp. nov.***

Shrub 6 to 8 ft. tall, glabrous. Leaves oblanceolate, shortly blunt, acuminate sessile, narrowed to a blunt auricled base ; nerves 10 pairs, elevate, secondary nerves finer, conspicuous, drying grey green, 8 in. long, 2.75 in. wide. Stipules short, coriaceous, ovate-acuminate with a short strong point. Cyme .5 in. long, dense, terminal .5 in. long with a short thick peduncle. Flowers numerous, greenish-white. Calyx short cylindric campanulate with 5 minute teeth. Corolla .15 in. long, tube short stout, lobes as long, oblong blunt, 5, mouth hairy. Stamens from mouth of tube filaments slender, rather long. Anthers short oblong. Tasan : Greenish-white ; 6 ft. tall ; 6853 : white ; 8 ft. ; 6945.

This belongs to the stiff-leaved pale group *Griffithii*, etc., but has sessile auricled leaves.

**137. *Psychotria* ? *lasiocephala*, *sp. nov.***

Hairy, woody shrub. Leaves thin, coriaceous elliptic lanceolate, grey, glabrous above, closely velvety hairy beneath ; nerves 12 pairs, 6 in. long, 1.75 in. wide ; petiole .5 in. long. Stipules large, triangular, subulate connate .5 in. long. Flowers in dense globose terminal heads. Bracts lanceolate. Calyx-lobes lanceolate, large, densely covered and fringed with long purple hairs. Corolla very short, glabrous, lobes oblong. Stamens 5. Style very short, entire. Tapli : Inflorescence green ; shrub.

The flowers are all very young, so it is difficult to be sure it is a *Psychotria*.

**138. *Chasalia curviflora*, Thw.**

Tasan : Yellow, outer side yellowish white tipped with pink ; bush ; 6923. *Distrib.* India and Malaya.

**139. *Lasianthus flavescens*, King.**

Tasan : White ; 8 ft. ; 6945 ; 4 ft. ; 6973. *Distrib.* Malay Peninsula.

140. *Lasianthus ellipticus*, Wight.

Tasan : Fruit whitish to blue at base ; 7007. *Distrib.* Malay Peninsula.

141. *Lasianthus (Litosanthes) glaberrima*, *sp. nov.*

Glabrous shrub, 5 ft. tall. Leaves sub-coriaceous, thin drying grey, elliptic, rather long acuminate, base round ; nerves fine, 7 pairs, sub-sessile, 6 in. long, 2 in. wide. Stipules breaking up into fibres. Peduncles axillary slender, 1.5 in. long. Flowers crowded at tip on a short peduncle, .1 in. long. Calyx-lobes linear rather long. Corolla in bud .2 in. long. Fruit ellipsoid, narrowed at base and top, of 4 large pyrenes distinctly lobed when dry, .25 in. long. Tasan : Fruit mauve ; 7033.

The specimens rather too far over, there is only one bud and a single detached fruit. The corolla looks rather long tubed for this genus, but I cannot make it out to be anything else.

## COMPOSITAE.

142. *Adenostemma viscosum*, Forst.

Tasan : White ; 1 foot. *Distrib.* Tropics.

143. *Elephantopus scaber*, L.

Mamoh, Pakchan River : 6703. *Distrib.* S. American weed all over tropical Asia.

144. *Blumea myriocephala*, DC.

Tasan : Yellow ; 7044. *Distrib.* India.

145. *Blumea membranacea*, DC.

Koh Gah : Yellow ; 6598. *Distrib.* India, Malaya.

146. *Pluchea indica*, Less.

Nam Chut : Pale lilac ; bush ; 6659. Koh Pipidon ; 6559 ? *Distrib.* Sunderbuns, Malay Peninsula and Islands, China.

147. *Wedelia biflora*, DC.

Pulau Mohea off Trang : Seashore ; flower yellow ; 6587 ; Koh Pipidon : 3 ft. high ; 6545. *Distrib.* Tropics of Asia.

## CAMPANULACEAE.

148. *Pentaphragma begoniaefolia*, Wall.

Tasan : White ; 6994. *Distrib.* Mergui, Penang.

## MYRSINACEAE.

149. *Maesa ramentacea*, Wall.

Tapli : Fruit green, tipped paler ; small tree, 8 ft. ; 6804. *Distrib.* India, Malay Peninsula.

150. *Maesa integrifolia*, *sp. nov.*

Shrub 1 foot tall, glabrous. Leaves thin coriaceous, oblong acuminate, base rounded, tip acute, edge entire ; nerves 7 pairs elevate beneath, 8 in. long, 2.25 in. wide ;



petiole .25 in. long. Racemes fascicled, slender, .5 in. to 1.5 in. long. Bracts lanceolate-acuminate half as long as the pedicel which is slender .8 in. long. Sepals very small, round, entire not glandular nor toothed. Corolla-tube as long as sepals, globose at base and narrowed abruptly below the limb, lobes 5, round, imbricate. Stamens 5, anthers sub-sessile on the mouth of the tube, style cylindric as long as tube. Ovary flattened at top. Fruit ovoid globose, .1 in. long, crowned at the top with the conspicuous ovate-acute sepals. Tasan : White, tipped pink ; 1 foot ; 6720.

Very distinct in the entire leaves, only the younger ones having a faint trace of serration, short slender raceme and flask-shaped corolla.

**151. *Maesa indica*, DC.**

Tapli : White ; bush ; 6738. *Distrib.* India, Malay Peninsula.

**152. *Maesa paniculata*, DC.**

Tasan : White ; climber ; 6842. *Distrib.* Tenasserim.

**153. *Labisia potheria*, Lindl.**

Tasan : White ; 6835. *Distrib.* India, Malay Peninsula.

**154. *Ardisia complanata*, Wall.**

Mamoh : Flowers whitish, sepals crimson ; tree ; 20 ft. ; 6715. *Distrib.* India, Malaya.

**155. *Ardisia Amherstiana*, Mez. *var. lanceolata*, *var. nov.***

Tapli : Mauve pink ; small tree, 20 ft. ; 6785. The leaves of this plant are much more narrow lanceolate acuminate to both ends than they are in the typical forms, but it does not appear to be a common plant and has seldom been collected. *Distrib.* Tenasserim.

**156. *Ardisia crenata*, Roxb.**

Klong Bagatae : Fruit crimson ; 4 ft. ; 6574. *Distrib.* Common in open country, India, China, Malaya.

**157. *Ardisia villosa*, Roxb.**

Tapli : White, centre buff ; 4 ft. high ; 6747. Tasan : rose pink, centre of flower dull yellowish ; 7013. *Distrib.* Tenasserim, Malay Peninsula.

**158. *Ardisia bractescens*, *sp. nov.***

Unbranched or little branched shrub, 1 foot tall ; stem woody .12 in. through. Leaves at top only. Leaves herbaceous, broad, lanceolate-acuminate, base cuneate, edge crenate gland-dotted sparsely on both sides, glabrous, 6.5 in. long, 2.25 in. wide, petiole .15 in. long. Panicle axillary 1 in. long, few flowered ; peduncles and pedicels dotted with minute black hairs. Pedicel .3 in. long. Bracts at base of pedicels 2, oblong in pairs, gland-dotted .1 in. long. Sepals lanceolate acuminate as long as petals or longer .18 in. long, dotted with black glands and short black hairs. Petals ovate-lanceolate acuminate, glandular. Stamens shorter,



elongate, triangular, back rounded with a row of black dots down the back. Style shorter than the stamens, blunt. Tasan : Rose pink ; 6883.

This species is remarkable for its rather large distinct bracts and short petals.

**159. *Ardisia* (§ *Pimelandra*) *congesta*, *sp. nov.***

Small tree 4 to 15 to 20 ft. tall, glabrous. Leaves thin, coriaceous, elongate, elliptic, shortly acuminate, blunt, base narrowed blunt ; nerves 20 pairs, slender elevate beneath, 9 in. long, 2·25 in. wide ; petiole ·25 in. long. Flowers in dense axillary fascicles, shorter than petiole, glabrous. Pedicels ·05 in. long. Sepals narrow, oblong blunt, densely glandular. Corolla ·25 in. across. Petals lanceolate acuminate, blunt, glandular. Stamens lanceolate acuminate, glandular. Style long and slender shorter than stamens. All glabrous. Tasan : dull crimson ; 15 to 20 ft. ; 6993 : crimson ; 4 ft. ; 6879. Distinguished from *Ardisia pachysandra*, (*Pimelandra Wallichii*) and *Teysmanniana* by being quite glabrous, the flowers much smaller on very much shorter pedicels with longer narrower petals.

EBENACEAE.

**160. *Diospyros siamensis*, Hochr.**

Koh Jam Yai off Takuapa : Tree ; flowers apricot yellow ; fruit large, egg-shaped, green with reddish fur ; 6632. *Distrib.* Siam South to Kedah.

**161. *Diospyros flavicans*, Hiern.**

Tasan : Yellow ; tree 20 ft. ; 6874. *Distrib.* Tenasserim to Malay Peninsula.

**162. *Maba merguensis*, Hiern.**

Koh Jam Yai off Takuapa : Tree ; white ; 20 ft. *Distrib.* Tenasserim, Malay Peninsula and Islands.

OLEACEAE.

**163. *Jasminum syringaefolium*, Wall.**

Klong Bagatae : White ; bush ; 6573 and 6572. *Distrib.* Assam, Tenasserim.

**164. *Jasminum decussatum*, Wall.**

Nam Chut, Pakchan Estuary : Flowers white ; 6652. *Distrib.* Tenasserim to Kedah.

**165. *Jasminum puberulum*, *n. sp.***

Branches puberulous. Leaves thinly coriaceous ovate acuminate base round, glabrous shining when adult ; nerves 4 pairs inarching elevate beneath, sunk above, 4 in. long, 1·75 in. wide, petiole ·25 in. Cymes puberulous, 1·5 in. long and wide. Calyx cup-shaped ·1 in. long, lobes as short, linear hairy. Corolla white, tube stout, ·25 in. long, lobes 8, linear sub-acute, as long as the tube.

Koh Jam Yai off Takuapa : White ; climbing bush ; 6622. Allied to *J. decussatum* but nearly glabrous and with shorter only puberulous hairy calyx-lobes, and petals distinctly larger.

## APOCYNACEAE.

166. *Rauwolfia perakensis*, King.

Tasan : Petals red, base of flower white ; 6912. *Distrib.* Malay Peninsula.

167. *Alyxia lucida*, Wall.

Klong Bagatae : White climber ; 6575. *Distrib.* Malay Peninsula.

168. *Vallaris macrantha*, Ridl. *n. sp.*

Woody shrub 15 ft. tall. Stem .5 in. through with pith. Leaves membranous orbicular with a short point, base round, minutely pustular above, pubescent beneath ; nerves 6 pairs, reticulations conspicuous, wide beneath, 5.5 in. long, 5 in. wide ; petiole 1 in. long. Compound cymes axillary lax, 6 in. long and wide, pubescent tomentose. Bracts caducous, oblong lanceolate, acute, .25 in. long. Pedicels .5 in. long, dilate upwards, slightly tomentose. Sepals 5, oblong, recurved or patent, .25 in. long, tomentose. Corolla pale yellowish green, tube broad, cylindric, .25 in. long, limb 1 in. across, base broadly obconic pubescent, outside and on the inner face of the 5 lobes oblong-lanceolate, .2 in. long. Stamens on the mouth of the cylindric tube, base hairy, filaments glabrous. Anthers conic acuminate hastate, hairy at base and tip with rather long deflexed spurs at base. Style densely white hairy ; ovary bilobed globose, densely white tomentose, top rounded. Tapli : Pale yellowish green ; 15 ft. ; 6946.

This remarkable plant is only allied to *V. grandiflora*, Hemsley of China, from which it differs conspicuously in its wide spreading axillary compound cymes, entirely whitish tomentose.

169. *Cerbera odollam*, L.

Koh Gah : White ; opening of tube only red ; 6604. Klong Bagatae : White, centre red, bush ; 20 ft. ; 6570. *Distrib.* East Asia.

170. *Holarrhena pauciflora*, Ridl.

Mainland shores of Takuapa : Flowers white, a dull yellow stripe on outside of petals ; 6613. *Distrib.* Perlis.

171. *Holarrhena densiflora*, Ridl.

(Label missing). *Distrib.* Perlis.

172. *Ervatamia subcapitata*, Wall.

Tasan : White ; climber ; 4 ft. tall ; 7021 and 6824. *Distrib.* Tavoy to Mergui.



**173. *Strophanthus dichotomus*, DC.**

Tapli : Petals white, tinged yellow and streaked crimson, tips deep crimson ; bush ; 6762. Tasan : Base yellow, distally dark crimson ; 6924. *Distrib.* Tenasserim, Malay Peninsula and Java.

**174. *Strophanthus Wallichii*, DC.**

Nam Chut : Pale lilac spotted with deep crimson ; 2-3 ft. ; 6689. *Distrib.* India.

**175. *Strophanthus perakensis*, Scortechini.**

Tasan : White ; tree. The leaves are rather thinner and the nerves more marked than in the rather poor type I have seen. *Distrib.* Perak.

**176. *Strophanthus Jackianus*, Wall.**

Tapli : Crimson ; 6764 : Scarlet ; bush ; 6733. This is just the form of Wallich's type with the broad leaves covered with hair on pustules beneath. *Distrib.* Penang.

**177. *Aganosma marginata*, Don.**

Koh Jam Yai off Takuapa : White ; scandent shrub ; 6624. *Distrib.* India, Malay Peninsula.

**178. *Anodendron paniculatum*, DC.**

Tapli : Yellow ; 4-6 ft. tall. *Distrib.* India, Malay Peninsula and Islands.

**179. *Anodendron Candolleianum*, Wt.**

Mamoh on the Pakchan river : Brown ; tree ; 6669. In fruit. *Distrib.* Malacca, Borneo.

## ASCLEPIADACEAE.

**180. *Hoya parasitica*, Wall.**

Tasan : White, central star-shaped portion crimson ; 6909. *Distrib.* Assam to Malay Peninsula.

**181. *Dischidia hirsuta*, Dene.**

Tasan : Crimson at base, pink distally ; 7037. Tapli : crimson ; creeper on trees ; 6797. *Distrib.* Tenasserim, Malay Peninsula, Java.

**182. *Dischidia lancifolia*, *sp. nov.***

Stems long, slender, twining, glabrous. Leaves narrow lanceolate, sub-acute or blunt, narrowed to tip, fleshy ; nerves 3 pairs inarching, nearly invisible, 3 in. long, .6 in. wide ; petiole .05 in. Flowers very small in axillary fascicles with ovate bracts. Pedicels very short. Sepals ovate blunt. Corolla whitish yellow, .05 in. long ; tube globose, abruptly narrowed at top ; lobes lanceolate with long straight, erect hairs at base. Anther column short, broad, blunt. Corona scales anchor-shaped. Pollinia linear-oblong, disc very small, elliptic, dark red. Capsule elongate, narrow lanceolate, 1.5 in. long, valves .1 in. wide. Seed linear-oblong, plume-hairs .5 in. long.

Mamoh : Petals white, calyx yellow ; climber ; 674. Tapli : Whitish yellow ; climber ; 6805.



Allied to *D. Scortechinii*, Gamble, and resembling it in its leaves but flowers in a very short fascicle of bracts, sessile in the axils and hardly half the size.

## LOGANIACEAE.

183. *Fagraea racemosa*, Jack.

Tasan : Fruit green ; tree ; 6998. *Distrib.* Malay Peninsula.

## GENTIANACEAE.

184. *Limnanthemum cristatum*, Griseb.

Klong Bagatae : Flowers white ; creeping ground plant ; 6577.

## BORAGINEAE.

185. *Cordia subcordata*, Lam.

Koh Pipidon : Flowers scarlet orange ; tree ; 6559. *Distrib.* Sea shores, Andamans, Malay Peninsula and Islands to Polynesia.

186. *Coldenia procumbens*, L.

Tapli : White ; leaves grey green. *Distrib.* Sandy places. All tropics.

187. *Tournefortia argentea*, Linn. fil.

Koh Pipidon : White, throat green, stamens yellow ; 6546. *Distrib.* Mauritius, Ceylon, Nicobars, Butang Ids., Malay isles to Australia.

188. *Rhabdia lycioides*, Mart.

Tasan : Deep pink ; growing in water ; 6880 : Purplish-red ; fruit dull crimson ; in river ; 6962. *Distrib.* India, Siam, Borneo, not in Malay Peninsula.

## CONVOLVULACEAE.

189. ? *Argyreia splendens*, Sweet.

Koh Jam Yai : Climber ; fruit crimson ; 6626. Only a spray of fruits, so I am not sure of the species.

190. *Lettsonia peguensis*, Clarke.

Tasan : Pink to white ; creeper ; 6991 and 7020. *Distrib.* Burma South to Malay Peninsula.

191. *Ipomoea grandiflora*, Lam.

Tasan : Crimson ; 6949. *Distrib.* Indo-Malaya. The colour is usually given as white.

192. *Ipomoea denticulata*, Choisy.

Mamoh : Crimson ; climber ; 6723. *Distrib.* Mergui, Ceylon, Malay Peninsula and Islands to Polynesia, Mascarenes.

193. *Merremia umbellata*, Hallier.

Tasan : Apricot yellow ; 6848. *Distrib.* Old World Tropics.

SOLANACEAE.

194. *Solanum torvum*, Sw.

Tasan : Bush, 7 to 8 ft. ; white. *Distrib.* Tropics.

SCROPHULARINEAE.

195. *Bonnaya reptans*, Spreng.

Tasan : Dark to light violet-blue ; reverse of leaves dull crimson ; 6965. *Distrib.* Indo-Malaya.

196. *Scoparia dulcis*, L.

Tasan : Greenish white ; 7019. *Distrib.* Introduced from South America ; now a weed all over most of the tropics except Polynesia, a large part of India and Ceylon.

LENTIBULARIACEAE.

197. *Utricularia exoleta*, Br.

Klong Bagatae : Pale yellow ; 2-4 in. high ; 6576. *Distrib.* Malaya, Australia.

GESNERACEAE.

198. *Cyrtandra bicolor*, Jack, *var. septentrionalis*, *var. nov.*

Whole plant except inflorescence sub-glabrous ; nerves sparsely hairy ; petiole 8 in. long. Leaves thinner in texture. Tasan : Flower pale yellow ; 6978.

The *Cyrtandras* abundant in Eastern Malaya, disappear towards the North of the Peninsula; the only one known North of the Malay Peninsula is a form of *C. pilosa*, Bl., which occurs in Tenasserim. This plant appears to be a variety of the common Southern *C. bicolor*, Jack (*C. pendula*, Bl.), its furthest Northern habitat.

199. *Aeschynanthus marmorata*, T. Moore.

Mamoh : Leaves above pale and dark green ; below pale green and crimson ; midrib crimson ; 6722. Tapli ; 6740.

BIGNONIACEAE.

200. *Dolichandrone spathacea*, L.

Nam Chut : Flowers white ; fruit yellowish ; 6695. *Distrib.* Burma, Malay Peninsula and Islands.

201. *Heterophragma adenophyllum*, Seem.

Tapli : Large tree ; flowers white. *Distrib.* Assam, E. Bengal to Tenasserim and Kedah.

**202. Radermachera amoena, Seem.**

Tapli : Buds pink ; flower opened, white ; 6773. *Distrib.* Moulmein, Malay Peninsula and Islands.

**203. Pajanelia multijuga, Kurz.**

Tapli : Fruit green ; tree, 40 ft. ; 6780. *Distrib.* India, Tenasserim, Malay Peninsula.

**ACANTHACEAE.****204. Thunbergia laurifolia, Lindl.**

Tasan : Lilac blue, throat yellowish striped with brown ; 6869. Nam Chut : Pale violet ; creeper. *Distrib.* Arracan to Malay Peninsula.

**205. Ebermaiera merguensis, Anders.**

Tasan : White, deep crimson patch on one petal ; 6984 : Pinkish white, crimson patch on lip ; 6974. *Distrib.* Mergui, Malay Peninsula.

**206. Ebermaiera lasiobotrys, Nees.**

Tapli : crimson ; 6802. Tasan : Purplish crimson, tips of flower petals white and white spot on end of upper petal ; 6967 : Dull crimson, edge of lip white ; 6953. *Distrib.* Lower Burma, Malay Peninsula.

**207. Ebermaiera angustifolia, Anders.**

Tasan : White, tipped pink ; 1 foot ; 6920. *Distrib.* Burma, Tenasserim, Malay Peninsula. The one specimen has an elongate stem with pairs of axillary branchlets bearing spikes which is not usual.

**208. Ebermaiera viscida, sp. nov.**

Stems decumbent, 6 to 12 in. rather stout, viscid, tomentose. Leaves elliptic blunt, base narrowed, viscid pubescent on both sides but chiefly on the back ; nerves 6 pairs elevate beneath, 3 to 5 in. long, 1 in. wide in rather distant pairs. Petioles 1 in. long ; bracts broad, spatulate, green, glabrous caducous .2 in. long. Calyx-lobes lanceolate-linear acuminate, narrow viscid, .2 in. long. Corolla .5 in. long, base of tube narrow then abruptly dilate, cylindric, lobes small, white tipped with crimson. Fruit oblong blunt at both ends, grooved longitudinally, shorter than the sepals.

Tasan : White tipped with crimson ; 6911.

Allied to *E. Griffithiana* but the stem longer, leaves and stem viscid, hairy and flowers with purple petals. It evidently grows in sandy spots as much sand adheres to it.

**209. Nelsonia campestris, Br.**

Tapli : Violet ; 6752 and 6746. Tasan : Pale blue ; 6830.

**210. Strobilanthes lancifolius, Anders var. laxior.**

Sepals and bracts narrower more acute and spike more lax ; the tuft of flowers being .25 to .5 in. apart.

Tasan : Purple, base of lip yellow ; 6859. *Distrib.* Tenasserim.



**211. *Strobilanthes subcapitatus*, Clarke.**

Tasan : Violet, whitish at base ; 7036. *Distrib.* Tenasserim.

I am not certain of this, the type specimens are larger and older and have no corollas and this specimen is small and younger.

(*Strobilanthes violacea*, Ridl. Journ. Straits Branch Royal Asiat. Soc., No. 57, p. 80, 1911. This name is anticipated by Beddome : I alter it to *Strobilanthes phoenicea*, Ridl.).

**212. *Strobilanthes violascens*, *sp. nov.***

Tall plant. Stem woody, young parts densely brown hairy. Leaves opposite herbaceous, glabrous with many raphides-bundles on upper surface, elliptic-lanceolate, sub-acute, base cuneate, edge serrulate ; nerves 12 pairs, slender, elevate beneath, 9 in. long, 4 in. wide ; petiole 3 in. long, hairy. Racemes axillary, 2·5 in. long (or more for they are young in specimen). Bracts narrow lanceolate, cuspidate ·25 in. long. Sepals linear acuminate, hairy free to base, ·25 in. long, narrow. Corolla 1·5 in. long, base ·25 in. long, narrow, then campanulate, lobes rather short, rounded, pale violet and yellowish, glabrous. Stamens 4, quite glabrous, anthers oblong.

Tasan : Pale violet and yellowish ; 6833.

Allied to *S. collinus* of the Malay Peninsula but the stamens are quite glabrous. The stem above is knotted, swollen just above the nodes.

**213. *Acanthus ilicifolius*, L.**

Nam Chut : Blue, petals whitish at base ; 6675. *Distrib.* India, Malay Peninsula, chiefly in the North, Malay Islands and Australia.

**214. *Cystacanthus pulcherrimus*, Clarke.**

Klong Bagatae : Pale pinkish-white, spotted crimson inside, spotted brown on lower side of throat ; 2 to 4 ft. high ; 6563. Nam Chut : Pale lilac, spotted deep crimson ; 2 to 3 ft. ; 6689.

**215. *Gymnostachyum trilobum*, *sp. nov.***

Stems slender, decumbent, creeping, 6 in. or more then ascending 3 in., internodes long. Leaves opposite herbaceous, ovate-lanceolate or sub-elliptic, blunt, paler beneath, glabrous ; nerves 4 to 5 pairs, 2 to 3 in. long, 1·5 in. wide ; petiole 1 in. long. Flowers in pairs on a spike 9 in. long or more. Bracts lanceolate acuminate, 1 in. Sepals free nearly to base, linear acuminate longer. Corolla tube ·1 in. long, upper lobe lanceolate, erect nearly as long, lower lip deeply 3 lobed, lobes linear obtuse, midlobe elliptic, broader, white or lilac white, lower lip spotted crimson at base. Stamens 2, linear-oblong, cells parallel, purple, shortly acuminate at base, filaments puberulous.

Tapli : Lilac white, lip spotted crimson near base ; 6726. Tasan : White, spotted purple ; 6857.

Allied to *G. diversifolium* King. but the flowers much smaller than in most of this set and the lower lip unusually deeply tri-lobed.

**216. *Lepidagathis hyalina*, Nees.**

Tasan : White, hood largely brown ; 6862 : Whitish, hood spotted brown, lip crimson ; 6861. *Distrib.* India, S. China, Malay Peninsula.

**217. *Lepidagathis chlorostachya*, Nees.**

Tasan : Whitish ; 6889 : Yellowish white, hood pale brown ; 2 ft. ; 6917. *Distrib.* Mergui, Penang.

**218. *Lepidagathis parviflora*, Bl.**

Nam Chut : White, lip spotted crimson. *Distrib.* Siam, Java.

The specimen has more lanceolate and hairy leaves than in type.

**219. *Pseuderanthemum malaccense*, Lindau.**

Tasan : Lilac ; 2 to 4 ft. ; 6837. *Distrib.* Malay Peninsula.

**220. *Pseuderanthemum crenulatum*, Nees.**

Tasan : Petals pink, white at centre ; 2 ft. ; 6921, (the big form). Klong Bagatae : Pale violet ; 2 to 4 ft. ; 6581. Koh Pipidon : Lilac to mauve ; 1 to 1.5 ft. high ; 6541, (the form with broad elliptic leaves, 7 in. long, 3.5 in. wide, characteristic of this region to Perlis). Tasan : white ; 6918, (the ordinary Malay Peninsula form). *Distrib.* Burma, Cambodia to Malay Peninsula.

**221. *Pseuderanthemum angustifolium*, *sp. nov.***

Stem erect, woody, 12 in. tall, little branched. Leaves few at the base of the racemes, linear lanceolate-acuminate, blunt coriaceous ; nerves 5 pairs, 2.75 in. long, .3 in. wide ; petiole very short. Racemes slender 6 to 13 in. long, base nude. Inflorescence 3 in. long, puberulous. Flowers solitary .25 in. apart, white. Bracts lanceolate .1 in. Sepals very narrow, linear-acuminate, .12 in. long. Corolla-tube slender, cylindric .75 in. long, pubescent ; lobes oblong, tip broad round .25 in. long. Stamens, tips only exsert. Style very slender, filiform .75 in. long, pubescent.

Koh Pipidon : Flowers white ; 6557. Quite unlike anything I know in its few coriaceous narrow leaves and remote pubescent flowers.

**222. *Justicia purpurascens*, *sp. nov.***

Creeping and ascending herb. Stems ascending 6 to 7 in., hairy tomentose. Leaves ovate or oblong-ovate, acuminate, base round, purple beneath ; nerves 6 pairs prominent beneath, hairy on both sides ; midrib and nerves beneath felted, 4 in. long, 2 in. wide, petiole 2 in. long, felted tomentose, spike terminal, .5 to .25 in. long ; peduncle .75 in. Bracts rhomboid ovate narrowed at both ends, hairy especially on edges, .25 in. long and a little narrower. Flower sessile. Sepals very narrow linear filiform. Corolla tube



cylindric, .25 in. long, dilate near mouth and at base, glabrous outside, lobes short, lower lip pubescent above shortly lobed. Anthers hairy curved, purple with a white spur. Capsule fusiform, shorter than the bracts, acute hairy.

Tasan : Yellowish-green, spotted crimson ; 6919 : Bracts pale green tipped with red, reverse of leaves crimson ; 6983.

A very distinct species in its hairiness and the rhomboid bracts and small flower.

**223. *Justicia subcoriacea*, *sp. nov.***

Shrublet 2 to 2.5 ft. tall ; branches woody with pale bark quite glabrous. Leaves elliptic narrowed and oblique at the base, tip blunt, rounded or shortly blunt acuminate, edge crenulate, coriaceous light green when dry ; nerves 4 pairs, sunk above, prominent beneath, 4 to 4.5 in. long, 2 to 3 in. wide ; petiole .5 in. long. Spike terminal, 3 in. long, peduncle .5 in. Bracts green, coriaceous, ovate acute, base broad, .4 in. long, .2 in. wide keeled and nerved. Calyx-lobes short, narrowly acuminate from a broader base. Corolla .75 in. long, tube straight cylindric, lobes as long, upper lobe lanceolate narrow, lower lobe obovate, wider, strongly nerved. Filament half as long as upper lobe ; anther-cells oblong, the lower one with a short white conical acute spur. Capsule 1 in. long, dilated upwards, acute. Seeds orbicular, thickly white-pustular.

Koh Pipidon : White, striped deep crimson ; 2 to 2.5 ft. high ; 6542. Very distinct in its shrubby habit and glabrous coriaceous leaves.

**224. *Justicia Gendarusa*, L.**

Mamoh : Purplish to pinkish white ; 1-2 ft. ; 6702.

*Distrib.* Tropical Asia.

**225. *Justicia valida*, Ridl.**

Tasan : Greenish-white ; 1 to 2 ft. ; 6899. *Distrib.* Kedah.

The specimens have more slender racemes and are nearly glabrous, but I do not think it can be separated.

**226. *Justicia quadrifaria*, Nees.**

Tasan : White ; one ft. ; 6840 : Pale greenish yellow ; 6 ft. ; 6826. Tapli : Upper petal white spotted crimson ; lip green ; 6753. *Distrib.* India, Malay Peninsula.

The form is quite like that of the Malay Peninsula which Clarke identified as *Neesiana* but which I think is not typical *Neesiana*.

**227. *Justicia* ( § *Henicophylla*) *viridiflora*, *sp. nov.***

Shrubby, 4 to 5 ft. tall, young parts pubescent. Leaves in very unequal pairs, larger one lanceolate-acuminate, base blunt slightly oblique ; nerves 5 pairs ascending, 6 in. long, 2 in. wide or less ; petiole .1 in., small leaf ovate .5 in. long, sub-sessile, .3 nerved. Cymes axillary hairy, .5 in. long of 3 to 4 branches. Bracts short, linear acuminate hairy.



Sepals lanceolate acuminate narrow hairy .12 in. Corolla tube short and broad, little longer than the sepals ; upper lobe broad blunt short, lower broader, rounded shortly lobed, reticulate veined within hairy ; lower lip green, spotted crimson. Stamens 2, anther-cells unequal narrow elliptic, the lower one with rather a long white conic process. Ovary narrowed cylindric, ellipsoid with style glabrous. Capsule .6 in. long, base narrow, seed bearing portion dilate indented between the seeds, tip acute, all hairy. Seeds orbicular pustulate.

**228. *Leda roseo-punctata*, *sp. nov.***

Straggling glabrous herb about 2 ft. tall. Leaves ovate to elliptic lanceolate sub-coriaceous ; nerves 5 pairs, base and tips narrowed, shortly acuminate, 4 in. long, 1.5 in. wide ; petiole .25 in. long. Panicle lax and spreading of 3 or more slender glandular pubescent branches about 4 in. long, peduncle above the uppermost pair of leaves 5 in. long, uppermost pair of leaves orbicular acute, .5 in. long. Flowers in pairs, sub-sessile. Bracts small, ovate lanceolate. Sepals lanceolate-acuminate, .1 in. long. Corolla .3 in. long, glabrous tube sub-cylindric, limb slightly dilate, lower tip little longer, broader than upper, strongly reticulate veined 3 lobed, midlobe broadest, white spotted crimson. Stamens 2, purple, cells of anther at unequal heights not tailed

Tasan : White spotted crimson ; 6910. Allied to *L. virgata* (*Dianthera virgata*, Benth.) but differing in foliage as well as glandular pubescence from any other of the Indian species. The Indian species of *Dianthera* have been separated from the American ones under the name of *Leda*.

**ANTHELIACANTHUS, *gen. nov.***

Shrubby herb. Leaves broad, lanceolate opposite. Spikes terminal, elongate. Flowers very small in distant pairs of fascicles sessile. Bracts linear acuminate. Calyx of 5 lanceolate-acuminate sepals connate at base. Corolla-tube hardly longer, base dilate above cylindric lobes sub-equal, very short, round. Stamens 2, anther-cells one slightly above the other not tailed. Ovary cylindric containing 2 ovules. Style simple, clubbed at tip. Capsule with a narrow base then dilate and indented between the 2 seeds, tip acute.

**229. *Antheliacanthus micranthus*, *sp. nov.***

Stem as thick as a crow quill, sub-glabrous. Leaves herbaceous ovate lanceolate acuminate, base long narrowed, nerves 10 pairs, slender, ascending, elevate beneath all glabrous, 6 in. long, 3 in. wide, petiole 1 in. long. Spikes 2, pubescent, 7 in. long. Flower fascicles .5 in. apart. Bracts linear-acuminate, .12 in. long. Sepals lanceolate, connate at base into a short cup, hairy, acute. Corolla hardly longer, .1 in. long, lilac, tube cylindric, slightly dilate at base then narrowed, lobes 5, round, pubescent all equal, very short. Stamens 2. Anther-cells pale, slightly un-

equally placed, glabrous. Pistil cylindric, top hairy 2 ovuled. Style simple, clubbed, purple. Capsule .4 in. long, hairy.

Koh Gah : Flowers lilac ; 6594.

**230. *Sphinctacanthus tabacifolius* sp. nov.**

Shrubby, 4 ft. tall. Leaves large herbaceous, glabrous elliptic acuminate cuspidate, base shortly narrowed ; nerves 6 pairs, transverse nervules few, reticulations large, 8.5 in. long, 4 in. wide ; petiole 2 in. long. Panicle terminal, dense, hairy, 5 in. long ; branches short ascending. Bracts lanceolate-linear acuminate hairy, .1 in. long. Calyx-lobes lanceolate hairy deeply cut as long. Corolla .25 in. long, hairy, tube stout as long as limb, slightly narrowed below the limb, pubescent ; upper lobe narrow, bifid at lip, lower three-lobed with long narrow blunt lobes, palate veined hairy. Stamens 2, anther-cells ellipsoid, nearly completely parallel, very shortly pointed at base, not tailed ; filaments hairy at base. Pistil as long as sepals. Style long, slender, all hairy.

Tasan : White ; 4 ft. ; 6973.

**231. *Rungia parviflora* var. *pectinata*.**

Tapli : Blue, spotted darker blue ; 6732. Tasan : Pale blue, lip blotched darker blue ; 6863. *Distrib.* Indo-Malaya.

**232. *Peristrophe acuminata* var. *fragilis*.**

Tasan : Pale violet, upper petal with a patch of white spotted deep crimson ; 6856. Tapli : Pale lilac ; 6734. *Distrib.* Mergui, Rangoon, Malay Peninsula. In these specimens the flower is distinctly larger than in the typical form.

### VERBENACEAE.

**233. *Callicarpa arborea*, Roxb.**

Koh Gah : Flower pale violet or deep lilac ; 6592. *Distrib.* Malay Peninsula.

**234. *Callicarpa villosissima*, sp. nov.**

Tree ; branches thickly yellow woolly tomentose with long plumed hairs. Young leaves densely tomentose ; adult leaves elliptic-acuminate, acute, base cuneate, entire above except scurfy midrib and side nerves, glabrous beneath densely tomentose with stellate and plumed hairs ; midrib densely covered with plumed hairs as are 13 pairs of nerves 10 in. long, 4.5 in. wide ; petiole stout, 1.5 in. long tomentose. Panicles 3 in. long and as wide, widely spreading densely tomentose. Flowers sessile or sub-sessile. Calyx short almost cup-shaped, very obscurely toothed. Corolla glabrous tube twice as long ; lobes oblong rounded. Stamens 4. Tasan : Tree ; deep lilac ; 6851. This might be considered a variety of *C. arborea* but the indumentum is totally different and the flowers have a shorter calyx. The panicles are wider than in most forms. The distinctly plumed hairs are very curious.



235. *Premna integrifolia*, L.

Koh Pipidon : Flowers white ; tree. *Distrib.* Ceylon, Malay Peninsula.

236. *Vitex pubescens*, Vahl.

Koh Gah : White to pale violet ; tree. *Distrib.* India, Malay Peninsula and Islands.

237. *Clerodendron infortunatum*, Gaertn.

Tapli : White ; 3-4 ft. ; 6784 ; Nam Chut : White, base of petal red ; calyx greenish red ; 6673.

238. *Clerodendron neriifolium*, Wallich Cat. 1789.

Koh Pipidon : Flowers dull greenish yellow ; Stamens tipped red ; woody climber ; 6555. This is just the plant collected by Wallich on the shores of Tenasserim. It is given in the Flora of British India as occurring from Chittagong to Malacca. I have not seen anything like it in the Malay Peninsula, the species confused with it by Benthams and others being the fleshy-leaved white flowered bush *C. inerme* Gaertn., so abundant on our shores. The leaves are lanceolate and stiff not obovate and fleshy. The corollatube is an inch long, in Wallich's specimen, .75 in. A drawing in Roxburgh's collection has white flowers and white stamens. *Distrib.* Tenasserim.

239. *Congea tomentosa*, Roxb.

Mamoh on the Pakchan, Renong ; 6703. *Distrib.* Chittagong, Burma, Annam.

240. *Sphenodesma microstylis*, Clarke.

Nam Chut : Pale green ; climber ; 6678. *Distrib.* Tavoy, Tenasserim to Perlis.

241. *Sphenodesma pentandra*, Jack.

Mamoh : Green ; climber ; 6707. Tasan : Climber ; bracts green ; 7038. *Distrib.* Assam, South to Malay Peninsula.

## LABIATAE.

242. *Dysophylla auricularia*, Bl.

Tasan : Pinkish white ; 6864. *Distrib.* Indo-Malaya.

## APETALAE.

## ARISTOLOCHIACEAE.

243. ? *Thottea tricornis*, Maing. & Hook. fil.

Tasan : Pinkish ; 2-ft. ; 6996. The flower has unfortunately perished but the foliage resembles this species. It is the first species of the genus collected in this region.

## PIPERACEAE.

244. *Piper pupuloides*, Roxb. Fl. Ind. I, 159.

Tasan : Fruit yellowish buff ; 6907. This closely resembles a plant collected by Helfer in Tenasserim (No. 4411) and labelled var. *angustifolium* at Kew. The leaves



are rather narrower than in typical specimens and ovate-lanceolate acuminate. *Distrib.* Himalayas to Tenasserim.

**245. Piper (S. Chavica) Kraensis, sp. nov.**

Climber. Stem .1 in. through, slightly woody; young parts pubescent. Leaves herbaceous elliptic-oblong, base broad unaequilateral; tips abruptly acuminate, point 1 in. long; nerves pinnate, 5-6 pairs, ascending, curved; nervules slender distant; nerves and midrib slightly pubescent beneath, 8 in. long, 4 in. wide, petiole .1 to .2 in. long. Spikes very slender, 10 in. long. Bracts orbicular peltate, stalk central. Tasan: Green climber; 7045. *Distrib.* Isthmus of Kra. This somewhat resembles but is distinct in its numerous nerves.

**246. Piper (S. Cubeba) polycarpa, sp. nov.**

Glabrous; stem woody. Leaves sub-coriaceous, oblong-lanceolate acuminate, base narrowed slightly and unequally rounded at extreme base; nerves pinnate, 10 pairs, slender distant inarching at tips, transverse nervules few and very inconspicuous, 6.5 in. long, 2 in. wide; petiole .25 in. Male spikes not known. Fruiting spikes 4.5 in. long, peduncle .5 to .75 in. long. Fruit orange quite globose when ripe, .12 in. through on slightly longer slender stalks.

Tasan: Fruit orange; 6888. I know nothing really like this Cubeb, the stiffness of the leaves suggests an affinity with *P. ribesioides*, but the shape of them and the smaller fruit is very different.

#### LAURINEAE.

**247. Litsea panamonja, Ham.**

Tasan: Yellow (pale apricot); tree; 7018. "Medang" (Malay). *Distrib.* Tenasserim and Malay Peninsula.

**248. Litsea aff. albicans, Kurz.**

Glabrous tree; twigs slender. Leaves alternate, thin, coriaceous oblong or ovate-oblong, base round or narrowed, tip acute, drying pale green beneath glaucescent, nerves 6 to 7 pairs, slender elevate beneath, nervules irregular and few, reticulations small, all rather faint and obscure. Flowers not seen. Fruit 1 to 3 together on a short .25 in. axillary raceme. Cupule basin-shaped, .25 in. deep and .3 in. wide, thin on a short thick stalk. Drupe ellipsoid, slightly narrowed to the tip, .6 in. long, .25 in. through.

Tasan: Green; tree, moderate size; 7052. "Medang." I cannot match this but have not seen flowers.

**249. Phoebe Tavoyana, Hook. fil.**

Tapli: Pale yellowish green; 15 ft.; 6796. *Distrib.* Tenasserim, Malay Peninsula.

**250. Cinnamomum nitidum, Bl. Hook. fil. F.B.I. 130.**

Mamoh: Tree; 6712. I take this to be the plant intended by Hooker, but the peduncle and branches are more distinctly hairy. It belongs to the very difficult set of *C. iners* of which all the species are very closely allied.

## MYRISTICACEAE.

251. *Myristica longifolia*, Wall. Cat. 6801.

Mamoh on the Pakchan river, Renong : Brown ; tree ; 6699 ; Tasan : Red ; tree ; 6936. *Distrib.* India from Sikkim to Tenasserim.

## PROTEACEAE.

252. *Helicia terminalis*, Kurz.

Tapli : Yellowish ; large tree ; 6815 *Distrib.* Ava.

253. *Helicia excelsa*, Bl.

Mamoh : Large tree ; Greenish-brown ; style black ; 6719. *Distrib.* Khasiya, Tenasserim, Cambodia, Malay Peninsula.

## HERNANDIACEAE.

254. *Illigera trifoliata*, Dunn.

Nam Chut : Climber ; fruit green, tipped and streaked red ; 6679. *Distrib.* India, Malay Peninsula.

255. *Hernandia peltata*, Meissn.

Koh Pipidon : Flowers white ; stamens yellow ; sepals and bracts pale dull yellowish green ; 6578. *Distrib.* Sea-shores, Africa, Madagascar, Ceylon, Andamans, Malay Peninsula and Islands, Polynesia.

## LORANTHACEAE.

256. *Loranthus pentandrus*, L.

Koh Pipidon : Flowers dull greenish yellow ; stamens tipped red ; woody climber ; 6555. *Distrib.* India, Malay Peninsula to Borneo, Sumatra and Java.

257. *Loranthus vulpinus*, *sp. nov.*

Branches black ; young parts red, scurfy. Leaves opposite, stiffly coriaceous when young densely red-tomentose. Adult glabrous or with midrib pubescent lanceolate-acuminate, shortly base rounded ; midrib prominent on both sides ; nerves invisible or very faint, 3 pairs, 2.5 in. long, 1 in. wide ; petiole .15 in. Flowers axillary, raceme, .5 in. long, densely orange-tomentose. Bracts lanceolate-acuminate .4 in. long. Calyx tube short with very obscure teeth. Corolla 1 in. long curved, narrowed a little above the dilate base and then dilated, lobes 4 or 5, linear, all red-tomentose and hairy. Stamens 4-5 ; anthers linear, .3 in. long. Style slender, all glabrous. Koh Jam Yai off the coast of Takuapa : 6623. Allied to *L. casuarinae*, Ridl. but the leaves smaller and much less hairy, and flowers much smaller.

258. *Elytranthe globosa*, Don.

Tapli : Yellowish green blotched with red ; 6808. *Distrib.* Malay Peninsula.



259. *Elytranthe albida*, Bl.

Mamoh : White, tips leaden ; stamens brown ; 6709.  
*Distrib.* Malay Peninsula.

260. *Viscum monoicum*, Roxb.

Tapli : Fruit orange ; bush ; 6779. *Distrib.* India,  
 Ceylon, Burma to Trang, Peninsular Siam.

## EUPHORBIACEAE.

261. *Bridelia stipularis*, Bl.

Tasan : Climber ; fruit green to black ; 6847. *Distrib.*  
 India, Malaya, Africa.

262. *Phyllanthus emblica*, L.

Nam Chut : Flowers green ; tree ; 6681. *Distrib.*  
 India.

263. *Phyllanthus Klossii*, *sp. nov.*

*P. baeobotryoides*, Hook. fil., F.B.I., V. p. 291 (in part).

Branches strongly 4-angled. Leaves thinly coriaceous, lanceolate acuminate, base rounded ; midrib on both sides scurfy, hairy ; nerves prominent beneath inarching 5 pairs, 5 in. long, 1·5 in. wide, slightly paler beneath ; petiole under ·05 in. Stipules narrow linear-acuminate. Racemes supra-axillary very slender, 6 in. long with distant, very short branches, ·05 in. long, ·5 in. apart of 5 or 6 flowers, lower ones with short lanceolate leaf-like bracts, ·1 in. long. Flowers ·1 in. wide, shortly pedicelled ; sepals ovate, fleshy with a low keel at base inside. Stamens in a cone, anthers lanceolate, connective not produced, apex blunt. Disc of 5, rather irregular oblong glands.

Tasan : Whitish 3 ft. or more ; 6877. Tenasserim (Helfer). This species does not appear to be the same as Wallich's Nepal *P. baeobotryoides*. The leaves are larger, the racemes much longer and more slender, the flowers in short racemes on the main rachis very far apart. The anthers of the male have no prolonged connective ; Hooker referred Helfer's Tenasserim plant to Wallich's species.

264. *Phyllanthus frondosus*, Bl.

Tapli : Flowers green ; shrub ; 6820. *Distrib.* Malay Peninsula.

265. *Breynia angustifolia*, Hook. fil.

Tasan : Small tree ; greenish yellow ; 6961. *Distrib.* Pegu, Tenasserim to Perak.

266. *Breynia reclinata*, Hook. fil.

Koh Gah : Fruit pale yellow ; bush ; 6 ft. *Distrib.* Malay Peninsula, Sumatra, Java.

267. *Breynia microcalyx*, *sp. nov.*

Shrub ; glabrous. Leaves round ovate, thinly coriaceous, drying pale green, base shortly narrowed, rounded, tip blunt ; nerves 4 pairs, slender, elevate beneath, 1·5 in. long, 1 in. wide ; petiole ·05, slender. Male flowers minute turbinate fleshy, lobes round incurved. Stamens 3, much

shorter in a cone blunt. Female flowers a little larger, turbinate, stigmas sunk. Fruit globose, .12 in. long, crimson. Calyx little enlarged, flat, small with 5 short acute lobes. Seed smooth semi-ovoid with a short point at tip.

Koh Pipidon off Ghirbi : Shrub ; fruit crimson ; 6547. It is very unusual for a *Breynia* to dry green, the leaves of most kinds being fleshy. This one belongs to the set in which the calyx though enlarged, (for the female flowers are very small) is not enlarged into a conspicuous cup.

268. *Aporosa Planchoniana*, Baill.

Nam Chut : Flowers yellow ; shrub ; 6668. *Distrib.* Tenasserim.

269. *Aporosa Prainiana*, Hook. fil.

Tasan : Yellowish ; 18 ft. ; 6825. *Distrib.* Malay Peninsula.

270. *Aporosa aurea*, Hook. fil.

Tasan : Pale dull yellow ; 6938. *Distrib.* Chittagong, Tenasserim, Malay Peninsula.

271. *Aporosa*, *sp.*

Branches velvety. Leaves rather thin, coriaceous, elliptic acuminate, base cuneate above glabrous except midrib beneath hairy especially on nerves 6 in. long, 2 in. wide, petiole .75 in. long, velvety. Fruit ovoid, globose .6 in. long velvety. Tasan : Fruit green ; tree ; 7008. Insufficient to describe as a new species but quite unlike anything I have seen.

272. *Baccaurea sapida*, Muell. Arg.

Mamoh on Pakchan River, Renong ; Deep pink ; tree ; 6700. *Distrib.* India, Burmah.

273. *Baccaurea parviflora*, Muell. Arg.

Tapli : Dull carmine ; 15 ft. tall ; 6771. *Distrib.* Tenasserim, Malay Peninsula, Sumatra.

274. *Antidesma velutinosum*, Bl.

Tasan : Yellow green ; Stamens tipped brownish ; 10 ft. ; 6897 : Greenish ; 3 ft. ; 6831. *Distrib.* Tenasserim, Malay Peninsula. It is generally bigger than these, which seem to be dwarf plants.

275. *Antidesma velutinum*, Tul.

Tasan : Pale brownish yellow ; Stamens yellow ; 10 ft. ; 6941. Nam Chut ; 8 ft. high ; 6687. *Distrib.* Pegu and Burma to Tenasserim.

276. *Galearia phlebocarpa*, Br.

Tapli : Inflorescence greenish, stalks white. *Distrib.* Malay Peninsula.

277. *Trigonostemon longifolius*, Baill.

Klong Bagatae : Flowers blackish crimson ; stamens yellowish ; fruit green to brownish green ; 12 ft. ; 6565. *Distrib.* Tenasserim to Singapore.



**278. Croton Griffithii, Hook. fil.**

Nam Chut : White ; stamens greenish ; 6674. *Distrib.* Malay Peninsula.

**279. Mallotus floribundus, Muell. Arg.**

Tasan : Whitish ; 10 ft. *Distrib.* Tenasserim, Cochinchina, Malay Peninsula and Islands, Samoa.

**280. Mallotus sp. aff. M. floribundus.**

Nam Chut : Inflorescence yellow ; shrub ; 6667. Leaves ovate rather stiff, acute, white beneath. Female flowers. Ovary covered with long grey hairy processes ; style short ; arms longer. Perhaps only a variety of *M. floribundus*.

**281. Chaetocarpus castanocarpus, Thw.**

Mamoh : Fruit yellowish-green ; large tree ; 6716. Tapli : Fruit green ; large tree ; 6819. *Distrib.* Ceylon, North of Malay Peninsula.

**282. Homonoia riparia, Lour.**

Nam Chut : Crimson and yellow ; Calyx red ; 3 ft. high ; 6677. Tasan : Red, centre brownish green ; 3-4 ft. ; River bank ; 6913. *Distrib.* India, Malay Peninsula, Java.

**283. Botryophora Kingii, Hook. fil.**

Tapli : Fruit (? flowers) crimson ; large tree ; 6812. This remarkable plant was originally collected in Perak by Kunstler. His specimens much resemble this but the leaves are much longer. Female flowers and fruit unknown.

## URTICACEAE.

**284. Trema amboinensis, Bl.**

Tapli : White ; veins on reverse of leaf pink ; 6810. *Distrib.* Malay Peninsula and Islands.

**285. Ficus gibbosa, Bl.**

Tasan : Fruit orange ; tree, 10 ft. ; 7043. *Distrib.* Indo-Malaya.

**286. Ficus chartacea, Wall.**

Tapli : Fruit green ; bush ; 6755. *Distrib.* Burma, Malaya.

**287. Hullettia Griffithiana, King.**

Klong Bagatae : Inflorescence white ; 10 to 12 ft. ; 6564. Tasan : Pale greenish yellow ; 6 ft. ; 6826. *Distrib.* Mergui.

**288. Laportea stimulans, Miq.**

Tasan : Stems pale violet ; capsules green ; tips whitish ; 15 ft. *Distrib.* Malay Peninsula and Islands.

**289. Pellionia javanica, Wedd., var. major.**

Tasan : Pinkish white ; 7030. Tapli : Petals white, calyx pink ; 6777 and 7055. *Distrib.* Tenasserim to Penang and South Malay Peninsula.

This form has unusually long petioles 4 in. long and leaves 8 in. long and 4 in. wide, in fact is a much bigger plant altogether than usual but the species is very variable.

The name *javanica* was given by Weddell by an error. It was based on a specimen labelled "Java, Lobb" but Lobb got it in Penang, and so far as is known it does not occur in Java.

**290. *Elatostemma lineolatum* var. *major*.**

Tasan : Pale green ; 6976. *Distrib.* India, Malay Peninsula ; but usually smaller.

**291. *Elatostemma acuminatum*, Brongn.**

Tasan : Pale green ; 2 ft. ; 6915. *Distrib.* India, Malay Peninsula, Java.

**292. *Boehmeria Klossii*, sp. nov.**

Shrub ; much branched, branches slender, glabrous. Leaves alternate elliptic cuspidate, base narrow, blunt, herbaceous, edge serrate tri-nerved beneath tessellate, 5 in. long, 2 in. wide ; petiole .75 in. long, slender ; stipules lanceolate acuminate. Males absent. Females in small heads .1 in. through. Flowers free, shortly stalked with a minute ovate bract at base. Perianth tubular elliptic, glabrous. Style simple, elongate. Achene smooth.

Tasan : White ; 6 ft. ; 6903. Allied to *B. malabarica*, Wedd.

CUPULIFERAE.

**293. *Castanopsis tribuloides*, DC.**

Tapli : Fruit green ; 6816. *Distrib.* India. The fruit resemble that of var. *echidnocarpa* but the leaves are larger and elliptic.

ORCHIDEAE.

**294. *Dendrobium tortile*, Lindl.**

Tapli : White, tinged and washed with pale crimson ; lip pale yellow, crimson at base ; 6775. *Distrib.* Burma, Tenasserim, Malay Peninsula.

**295. *Dendrobium Pierardi*, Roxb.**

Tasan : Very pale pink ; lip very pale green ; 6895. *Distrib.* Sikkim, Bengal, Tenasserim, Malay Peninsula.

**296. *Dendrobium Farmeri*, Roxb.**

Nam Chut : Petals pinkish and yellowish white, basal part of lip orange ; 6688. *Distrib.* Himalaya, Assam, Burma.

**297. *Dendrobium (Aporum) anceps*, Sw.**

Mamoh : Greenish-yellow, lip blotched crimson ; 6714. Tasan : Yellow to brown ; leaves green, edged crimson ; 6886.

**298. *Dendrobium (Pedilonum) secundum*, Wall.**

Klong Bagatae. *Distrib.* India, Malay Peninsula and Islands.



**299. *Eria bractescens*, Lindl.**

Tapli : Yellow, lip crimson except at tips ; 6803.  
*Distrib.* Mergui, Malay Peninsula.

**300. *Bromheadia palustris*, Lindl.**

Mainland shores of Takuapa : Lip crimson and yellow.  
*Distrib.* Malay Peninsula and Islands to Philippines. This seems to be its most northern locality.

**301. *Thecostele Zollingeri*, Rehb.**

Tasan : Greenish-yellow, tips whitish, one or two crimson stripes on petals ; hood blackish crimson ; lip white distally, yellowish at centre, wings crimson brown ; 7024.  
*Distrib.* Tenasserim, Malay Peninsula, Borneo.

**302. *Vanda teres*, Lindl.**

Mamoh, Pakchan : Three upper petals faintly tinged and more strongly streaked with purple ; two outer ones white, with a purple spur on the lower side ; lower petal (lip) light purple except interiorly where sides and lower part are yellow, spotted brown ; lingual portion purple ; 6718.  
*Distrib.* Assam, Burma.

**303. *Saccolabium ochraceum*, Lindl.**

Tapli : Buff, spotted brown, distal half of lip white ; 6730. *Distrib.* Sikkim, Tenasserim, Ceylon, Malabar.

**304. *Saccolabium flavescens*, *sp. nov.***

Stem stout, 2 in. long. Leaves lorate falcate, bluntly unequally bi-lobed ; slightly narrowed to base ; midrib prominent, 7 in. long, 1.75 in. wide. Racemes from lower part rarely with a single short branch, 4 in. long. Flowers small, scattered. Bracts minute deflexed, lanceolate acuminate. Pedicel rather thick, .25 in. long. Upper sepal oblong, slightly dilate at tip rounded, lower ones oblong-ob lanceolate. Petals slightly smaller, oblanceolate, blunt. Lip side lobes short truncate, erect, midlobe broadly ovate, sub-reniform, spur broad scrotiform saccate not septate, a short broad conic callus in the mouth. Column short and broad, rostellum short acuminate upcurved. Pollinia small, globose on a rather long strap-shaped pedicel and a round ovate opaque yellow disc.

Klong Bagatae : Flowers pale greenish-yellow ; 6582.

**305. *Trichoglottis acutifolia*, *sp. nov.***

Stem slender elongate over 8 in. long. Leaves narrow lanceolate very unequally bilobed one sometimes .25 in. longer than the other, acute, 3.5 in. long, .5 in. wide, sheaths tubular dilate upwards .4 in. long. Flowers very small on a very short lateral raceme under .1 in. long. Sepals, upper oblong blunt, spotted, lower ones ovate acute, petals nearly as long, narrower. Lip ; side lobes oblong truncate, squared midlobe large fleshy oblong ovate blunt pustular, spur very short, conic, a very small oblong truncate retuse lobe in the mouth. Column short broad, thick ; anther oblong broad, large. Pollinia large semi-ovoid, pedicel linear, broader at tip ; disc oblong truncate. Rostellum lobes triangular linear acuminate at tip deflexed.

Klong Bagatae : Flower yellow, lip white ; 6561.

Allied to *T. lanceolaria*, Bl. of Java, but the leaves are broader unequally bilobed. The sepals and petals are distinctly spotted with brown or dull red.

**306. *Dendrocolla trichoglottis*, Ridl.**

Tasan : Yellowish-white, top of hood yellow ; 6854. *Distrib.* Malay Peninsula. A plant labelled *Sarcochilus hystrix*, Rchb. Mergui (Griffith) in Herb, Lindley, seems to be this species.

**307. *Acriopsis indica*, Wight.**

Tapli : Greenish, spotted brown ; lip white ; epiphyte ; 6768. *Distrib.* Tenasserim, Penang.

**308. *Podochilus lucescens*, Bl.**

Tasan : Flowers white ; terminal ; 7006, 9049. *Distrib.* Tenasserim, Malay Peninsula, Java. The specimens in their narrower leaves approach *P. khasiyana*, Hook. f. but the lip is broad ovate as in *P. lucescens* and nearly trilobed at base.

**309. *Galeola hydra*, Rchb. fil.**

Tasan : Lemon yellow, interior petal blotched crimson brown on upper parts of inside ; 6841. *Distrib.* Sikkim, Tenasserim, Malay Peninsula, Sumatra, Java.

**310. *Didymoplexis*, sp.**

Tasan : White ; No leaves ; 4 in. ; 6969. The single specimen of this little plant differs from *D. pallens* in its very slender stem and smaller flower, but the flower is so delicate that it is almost impossible to dissect it and I am unwilling to make a new species of it.

#### ZINGIBERACEAE.

**311. *Globba pendula*, Roxb.**

Tasan : Orange yellow with one dark brown spot ; 6882. *Distrib.* Tenasserim.

**312. *Costus speciosus* var. *argyrophyllus*.**

Tasan ; White ; lip and hood blotched yellow ; calyx red ; 7001. *Distrib.* Tropical Asia.

**313. *Amomum argyrophyllum*, sp. nov.**

Rhizome slender elongate, stem 3 ft. Leaves lanceolate acuminate, long, narrowed to petiole, drying pale silvery silky on the back, 14 in. long, 2.5 in. wide ; petiole 4 in. long, sheaths 12 in., ligule short, oblong, rounded adnate to petiole. Capitulum conic, 2 in. long very shortly peduncled. Bracts coriaceous, glabrous oblong-lanceolate, blunt about 12, the largest 1.25 in. long, .75 in. wide, striate. Inner bracts lanceolate 1 in. long. Calyx 1.25 in. long, narrowly funnel-shaped with three short apiculate lobes. Corolla tube 2 in. long, slender at base, dilate upwards, lobes upper broad lanceolate, hooded, laterals lanceolate, 1.25 in. long, .5 in. wide. Lip obovate, entire, 1.5 in. long,



·6 in. wide ; tip round, mouth of tube hairy. Stamen filament ·25 in. long, anther oblong, crest very large, reniform ·5 in. across, top of anthers divaricate.

Tasan: White; lip scarlet at base then yellow in middle; 6952 ; white, lip in part crimson at base, yellow towards tip ; 7004.

Allied to *A. dealbatum*, Roxb. (*A. sericeum*, Roxb.) but much smaller with narrower leaves.

**314. *Amomum molle*, sp. nov.**

Whole plant 3 ft. tall. Rhizome ·25 in. through. Leaves lanceolate caudate, 12 in. long, 2 in. wide, base shortly narrowed, glabrous above, softly hairy beneath, petiole ·25 in. long, soft hairy, sheath narrow, hairy. Spike sub-cylindric, 2 to 2·5 in. through, on a peduncle, 3 to 4 in. long covered with pubescent bracts, the uppermost 2 in. long, lanceolate. Bracts of head lanceolate sub-acute, coriaceous striate pubescent, edge white, hairy, 1·5 in. long. Floral bracts tubular with 3 points pubescent, tip hairy. Calyx pubescent cylindric with 3 ovate lobes hairy at lip, ·6 in. long. Corolla tube 1 in. long, pubescent ; lobes linear oblong, pubescent blunt. Lip about as long, base oblong fleshy, middle depressed sub-saccate ; sides thin, strongly veined, centre and tip linear-oblong, fleshy. Anther oblong cells distinct fusiform narrowed to the ends ; crest linear oblong truncate, rather large with 2 short ears at the angles of the anther. Stigma broad.

Tasan : Yellow ; lip spotted crimson along the middle line ; 6955 : deep yellow spotted orange ; 6988.

**315. *Hornstedtia albomarginata*, Ridl.**

Koh Gah : Ground flower ; carmine edged white ; 6597.

Only a single head without leaves. I take it to be *H. albomarginata* of the Malay Peninsula.

**316. *Hornstedtia rubrolutea*, sp. nov.**

Stem ·5 in. through. Leaves glabrous, lanceolate-acuminate, cuspidate, 3 ft. long, 4 in. wide, petiole, 5 in. long, ligule oblong rounded, broad. Heads sub-cylindric, 3 in. long on a peduncle 1 in. long with rather distant bracts. Bracts ovate, thin, 1 in. long, ·75 in. wide, edge white, hairy; upper ones narrower. Calyx narrow tubular, thin. Corolla tube 1·5 in. long, slender, lobes linear oblong very narrow, the side ones almost ovate oblong. Lip narrow, entire, dilate and rounded at tip, ·75 in. long, ·20 in. wide at tip. Anther short oblong. No crest.

Tasan : Petals scarlet and yellow or scarlet and white ; 6972 : Crimson blotched yellow ; 6929.

The flowers are small for this section of *Hornstedtia* and the bracts edged with white hair are peculiar.

MARANTACEAE.

**317. *Phrynium capitatum*, Roxb.**

Tasan : Pinkish white ; 6 ft. ; 6828. *Distrib.* India.

**318. *Donax grandis*, Ridl.**

Koh Gah : White ; 6610. *Distrib.* Malay Peninsula and Islands.

## AMARYLLIDEAE.

**319. *Curculigo latifolia*, Dryand.**

Tapli : Yellow ; 6754. A form with narrow lanceolate acuminate woolly leaves and small compact stalked woolly inflorescence. *Distrib.* Burma, Malay Peninsula and Islands.

**320. *Crinum asiaticum*, L.**

Pulau Mohea off Trang : Flowers white ; stamens crimson ; 6529. *Distrib.* Seashores, India, Malaya.

## TACCACEAE.

**321. *Tacca palmatifida*, Bak. Journ. Linn. Soc. xv. 100.**

Tasan : Fruit greenish red. *Distrib.* Celebes.

The specimen being in fruit unfortunately adds little to our knowledge of this plant of which flowers are not known. It may perhaps be a lobed form of *T. palmata*.

**322. *Tacca cristata*, Jack.**

Tasan : Dark greenish brown, beard blackish crimson ; 6822. *Distrib.* Malaya.

## LILIACEAE.

**323. *Dracaena siamensis*, Ridl. ?**

Pulau Mohea off Trang : Fruit scarlet ; 6935. In fruit only. *Distrib.* Perlis.

**324. *Smilax leucophylla* var. *latifolia*.**

Tapli : Fruit green ; climber ; 6751. *Distrib.* Tenasserim (Helfer) ; Perak (Kunstler). A. de Candolle quoted his Tenasserim plant as *S. Blumei*, a totally different species. It is very distinct from the ordinary forms of *Smilax leucophylla*, and is probably specifically distinct, but at present we have only fruiting specimens. It is a stout woody climber with few scattered short thorns. Leaves coriaceous, ovate sub-apiculate base broad edge thickened, glaucous beneath, 8 in. long, 6 in. wide. Peduncle in fruit, 3 in. long ; pedicels 1 in. Fruit globose.

**325. *Peliosanthes hypogyna*, sp. nov.**

Tufted plant with a mass of thick roots at base. Leaf, petiole 7 in. tall, angled, blade elliptic-lanceolate, 8 in. long, 2.75 in. wide ; nerves conspicuous about 10. Racemes 5 in. long. Flowers pale greenish white, solitary in the bracts, .2 in. wide. Bracts linear acuminate, lowest ones  $\frac{3}{8}$  in. long shortening upwards. Pedicel .1 in. long. Perianth lobes ovate-lanceolate, blunt. Staminal ring adnate almost entirely to the tube and to the ovary, slightly notched between the anthers. Ovary completely inferior. Style shorter than stamens. Seed globose, pear-shaped.



Tasan : Pale greenish white ; 7016. Pulau Mohea : Fruit waxy blue ; 6534.

This belongs to the set with completely inferior ovary, the petals and sepals connate in a tube adnate to ovary and staminal ring.

#### XYRIDEAE.

##### 326. *Xyris tuberosa*, *sp. nov.*

Rhizome 2 in. or more long with densely set globose pubescent (eventually glabrous) bulbs  $\frac{3}{8}$  in. through. Stem solitary 1 in. long, covered with sheaths. Leaves 2 linear acuminate 7 in. long, .1 in. wide, flat not twisted. Culm 12 to 13 in. long, terets, rather slender. Capitulum globose, .25 in. long. Bracts orbicular, broad, centre elevated not keeled, edge broad, brown scarious and becoming lacerate.

Mainland shores of Takuapa : 6615.

This species is allied to *X. anceps*, Lam., but the singular rhizome with its globose bulb-joints and few leaves distinguishes it from any other species. The flowers are all over and gone in the specimens.

#### COMMELINACEAE.

##### 327. *Pollia sorzogonensis*, Endl.

Tasan : White, 2-4 ft. ; 6966, 6894. *Distrib.* Indo-Malaya.

##### 328. *Commelina nudiflora*, L.

Tasan : Blue ; 6935. *Distrib.* Cosmopolitan.

##### 329. *Aneilema conspicuum*, Kth.

Tasan : Pale violet ; stamens yellow ; 6908. Deep lilac, stamens yellow ; 1 ft. ; 6827. *Distrib.* India, Malaya.

##### 330. *Floscopa scandens*, Lour.

Tapli : Pale lilac ; 6743. Tasan : *Distrib.* Indo-Malaya, Australia.

#### FLAGELLARIACEAE.

##### 331. *Flagellaria indica*, L.

Koh Gah : Fruit brownish pink ; climber ; lower part woody ; 6603. *Distrib.* Tropical Asia, Seashores.

#### PALMAE.

##### 332. *Areca pumila*, Bl.

Tasan : Pale yellow ; 6 ft. tall ; 6823. *Distrib.* Malay Peninsula and Islands.

I take this to be *A. pumila*, Bl., but the specimen is incomplete and it might be *A. triandra*.

##### 333. *Pinanga canina*, Becc.

Tasan : Fruit crimson brown ; stems crimson ; 6873. *Distrib.* Province Wellesley, Borneo.

I take this to be Beccari's *canina*. There is a leaf of it collected in Tenasserim by Helfer, labelled *P. patula*, Bl. by Hooker, but I do not think it is that species.

**334. *Nenga macrocarpa*, Becc.**

Koh Gah : Flowers greenish-white ; tree 30 ft. 6588.  
*Distrib.* Malay Peninsula. A fruiting specimen only.

**335. *Iguanura Wallichiana*, Hook. fil.**

Tasan : Fruit red ; 6 to 7 ft., Stem slender ; 7010.  
*Distrib.* Malay Peninsula.

**336. *Licuala distans*, *sp. nov.***

Leaf petiole (upper part) slender, smooth, unarmed .25 in. through, blade 2.5 ft. long cut almost to the base into 26 narrow lanceolate lobes 2 in. across at the widest part, apex cut into about 6 acuminate acute lobes 4 in. long. Inflorescence glabrous, 4.5 ft. long sheaths 6, smooth, lowest 6 in. long with a low rib on one side, mouth brown lacerate into fibres. Spadix branches 2 from each sheath, slender, 6 to 9 in. long. "Flowers white." Flowers remote, pedicels .1 in. long, slender. Bracts minute, lanceolate. Calyx tubular, narrowed at base dilate slightly upwards with three very short points .12 in. Petals wide, spreading lanceolate acuminate, .12 in. long. Stamens 6, filaments lanceolate-acuminate, red when dry. Anthers linear, oblong yellow. Style slender, nearly as long as the stamens.

Koh Jam Noi, near Koh Jam Yai off Takuapa : Flowers white ; 6638.

This species approaches *L. peltata* of India from which it differs in its smaller pedicelled flowers and much cut up leaves.

**337. *Calamus myrianthus*, Becc.**

Koh Pipidon near Ghirbi or Krabi : Flowers dull greenish yellow ; centres dark greenish brown ; 6554. Tapli ; 6814. *Distrib.* Tenasserim, Siam.

**338. *Daemonorops Lewisianus*, Griff.**

Tasan. *Distrib.* Penang.

**339. *Zalacca Wallichiana*, Mart.**

Tasan : Fruit brown ; 6944. *Distrib.* Malay Peninsula, Tenasserim.

ARACEAE.

**340. *Alocasia denudata*, Miq.**

Koh Gah : Base of inflorescence white, remainder pale buff ; stems mottled ; 6953. *Distrib.* Malay Peninsula, Borneo.

The form is the very hastate one with long narrow lobes.

**341. *Aglaonema Helferi*, Hook. fil.**

This is allied to *A. oblongifolium* but smaller in all parts. The specimen is however, rather larger than the type.



**342. *Anadendron montanum*, Schott.**

A slender form with smaller ovate leaves. Tasan. *Distrib.* Tenasserim, Malay Peninsula.

**343. *Pothos scandens*, L.**

Tasan : Fruit (probably heads) pale brown ; inflorescence yellow ; 7041. Yellowish white, growing on tree ; 7057. *Distrib.* Indo-Malaya.

## CYPERACEAE.

**344. *Kyllinga monocephala*, Rottb.**

Tasan : Greenish white ; 6937. Cosmopolitan.

**345. *Cyperus haspan*, L.**

Tapli : mixed with *Floscopa scandens*, 6743. Cosmopolitan.

**346. *Cyperus malaccensis*, Lam.**

Nam Chut : Fruit brown, 5 ft. ; 6693.

**347. *Cyperus diffusus*, Vahl.**

Delisle Island, off Takuapa.

**348. *Cyperus diffusus* var. *pubisquama*, C. B. Clarke.**

Tapli : Brownish green ; 6756. *Distrib.* India, Malaya.

**349. *Mariscus microcephalus*, Presl.**

Tasan : Fruit golden brown ; 6884. *Distrib.* Tropics.

**350. *Hypolytrum latifolium*, Rich.**

Koh Pipidon : 6560. Klong Bagatae : Fruit brown var. *penangense*, C. B. Cl.

Delisle Island off Takuapa : 6646. Tasan : Brown ; stamens yellow ; 6997. The var. *Penangense* made a species by Clarke and based on a single specimen from Penang, reappears again in this collection but without fruit again. It differs from *H. latifolium* in its much longer cylindric fusiform flowering spikes. Elongate spikes occur occasionally in specimens of otherwise typical *H. latifolium* but in *Penangense* they are all like this. Until we get fruit it had better remain as a variety.

**351. *Mapania andamanica*, Kurz.**

Tasan : Fruit brown ; 7011. *Distrib.* Andamans.

**352. *Scleria levis*, Retz.**

Koh Gah : Fruit black or white ; inflorescence brown ; 6605. *Distrib.* India, Malay Peninsula and Islands, China.

**353. *Carex indica*, L.**

Tapli : 6817. *Distrib.* Tropical Asia.

**354. *Carex mapanifolia*, sp. nov.**

Tuited. Leaves thin, elongate lanceolate long narrowed to the base, 3 ft. long, 2 in. wide, acutely acuminate, edges scabrid enclosed at base in a tuft with brown lanceolate sheaths. Inflorescence 12 in. long central, peduncle 8 to 9 in. long covered with sheaths ; panicle dense, 3 to 4 in. long of dense sessile secondary panicles 1 in. long or less ; many flowered, white ; outer bracts of spikelet empty about 12,

linear ones acuminate. Upper spikelets male, lower with male and female flowers. Glumes in male linear lanceolate bifid or sub-caudate at lip. Anthers linear .2 in. long with very slender filaments. Hermaphrodite spikelets smaller, lower flowers female, upper ones male. Utricle very narrow, thin sub-cylindric, deeply bifid, lobes acute. Ovary ellipsoid, narrowed at the base and jointed at the top with the style. Style pale, narrowed upwards. Stigmas 3, purple, hairy.

Tasan ; white ; 6881 : Base of flower brownish ; Inflorescence whitish ; 7012.

This remarkable species is allied to *C. Helferi* of Tenasserim differing in its much denser spikes and broader leaves. The only other *Carex* of this set is *C. scaposa* of Cochin-China and China, and this remarkable broad-leaved group appears to be confined to this region.

#### GRAMINEAE.

355. *Cyrtococcum pilipes*, Stapf. (*Panicum pilipes*, Nees.).

Tapli : Fruit brown to yellow ; 6765. *Distrib.* Tropical Asia and Polynesia.

356. *Thysanolaena acarifera*, Nees.

Koh Jam Yai off Takuapa : A dwarf form ; 6637. *Distrib.* Tropical Asia.

357. *Neyraudia madagascariensis*, Hook. fil.

Tasan ; 6930. Klong Bagatae : 6585. *Distrib.* Tropics. Africa and Asia.

358. *Oxytenanthera nigrociliata*, Munro.

Tasan ; 7054. *Distrib.* India, Malay Peninsula, Sumatra, Java.

#### GNETACEAE.

359. *Gnetum Brunoniana*, Griff.

Tasan : Green, terminal spike whitish ; scandent bush, 9 ft. ; 7026 : Yellowish-white ; Bush ; 6870. *Distrib.* Tenasserim, Malay Peninsula.

360. *Gnetum scandens*, Roxb.

Tasan : Fruit ; green ; 6902. *Distrib.* India, Malaya.

#### CYCADACEAE.

361. *Cycas siamensis* ?

Koh Gah : Cone and leaf from one tree, young fruit from second tree, ripe fruit from third tree ; 6590. Only a young male cone received : I am not sure whether it is *C. siamensis* or *C. Rumphii*.

#### FERNS.

362. *Alsophila latebrosa*, Hook.

Tasan : A very pubescent form ; 7017 : Glabrous form ; 6868. *Distrib.* Indo-Malaya.



363. *Trichomanes javanica*, Bl.  
Tasan : 6950. Koh Gah : 6595. *Distrib.* Malay Peninsula and Islands.
364. *Pteris quadriaurita*, Retz.  
Delisle Island off Takuapa : 6644. Tapli : 6727. *Distrib.* Tropics.
365. *Microlepia Speluncae*, L.  
Tapli : 6759 and 6739. *Distrib.* Tropics.
366. *Lindsaya lanuginosa*, Wall.  
Mainland shores of Takuapa inlet : 6619. *Distrib.* Burma, Malay Peninsula.
367. *Asplenium nitidum*, Sw.  
Klong Bagatae : 6569. *Distrib.* S. Africa, India, Malay Peninsula.
368. *Asplenium unilaterale*, Lam.  
Tasan : 7034. *Distrib.* Tropics of Old World.
369. *Diplazium tomentosum*, Hook.  
Tasan : 6959 and 6989. *Distrib.* Burma and Malay Peninsula.
370. *Aspidium cicutarium*, Sw.  
Tasan : 7031. Tapli : 6735. *Distrib.* Tropics.
371. *Niphobolus adnascens*, Sw.  
Koh Jam Noi near Koh Jam Yai off Takuapa : 6636. *Distrib.* Old World and Tropics.
372. *Pleopeltis nigrescens*, Bl.  
Tapli : 6785. Tasan : 7056. *Distrib.* Indo-Malaya.
373. *Pleopeltis sinuosa*, Wall.  
Koh Gah off Takuapa : 6586. *Distrib.* Malay Peninsula and Islands.
374. *Taenitis blechnoides*, Sw.  
Klong Bagatae : 6496. *Distrib.* Ceylon, Malay Peninsula, Tenasserim.
375. *Stenochlaena sorbifolia*, L.  
Pulau Mohea off Trang : 6531. *Distrib.* Tropics.
376. *Gymnopteris subrepanda*, Hook.  
Tasan : 6995. *Distrib.* Malay Peninsula.
377. *Polybotrya appendiculata* var. *Hamiltoniana*, Wall.  
Tapli : 6741. Koh Gah : 6496. *Distrib.* Assam, Tenasserim, Malay Peninsula.
378. *Schizaea dichotoma*, Sw.  
Koh Prah Tong off Takuapa inlet. *Distrib.* Tropics.
379. *Angiopteris evecta*, Hoffm.  
Tasan : 6866. *Distrib.* Tropical Asia, Australia and Madagascar.
380. *Lygodium polystachyum*, Wall.  
Mamoh : 6710. *Distrib.* Tenasserim, Malay Peninsula.

### III. TWO NEW SIAMESE PLANTS.

By H. N. RIDLEY, C.M.G., F.R.S.

I have found the following undescribed species in a small collection sent me by Dr. F. W. Foxworthy, Forest Research Officer, F.M.S. They were obtained by a collector of the Forest Department who accompanied the expedition of the F.M.S. Museums Department to the northern half of the Malay Peninsula in 1919 (antea pp. 65-126).

#### ANONACEAE.

##### 1. *Milium concinna*, sp. nov.

Branches slender, bark dark brown lenticelled; young parts pubescent. Leaves rather distant oblong oblanceolate, blunt or subacute, base narrowed unequally bluntly bilobed, membranous to subcoriaceous, thin, glabrous or when young pubescent on the midrib beneath; nerves fine inconspicuous, 8 pairs, 4 in. long, 1.5 in. wide; petiole hairy or glabrous, .1 in. long. Flowers solitary or 2 on tubercles; pedicel slender, hairy, .5 in. long. Sepals ovate .12 in. long, hairy. Petals oblong, tip rounded, hairy on both sides, .25 in. long. Stamens about 7 whorls, 20 in all; anthers short, narrow, connective broad, flat irregularly rounded. Pistils 20, densely woolly on the top.

South-western Siam: Hat Sunuk near Koh Lak (Hamid No. 3820); Koh Lak (Hamid No. 3802). Native name *Pom rimpah*.

The specimens under No. 3802 differ in being much more hairy, the branches being densely 50 ft. tomentose, and the leaves hairy on the back; while No. 3820 is almost completely glabrous, only the young parts being pubescent.

#### DIPTEROCARPACEAE.

##### 2. *Pachynocarpus grandiflorus*, sp. nov.

Leaves oblong thin but stiff coriaceous elliptic acutely short acuminate, base narrowed, blunt; nerves 12 pairs prominent beneath, reticulations conspicuous beneath, 6 to 8 in. long, 2.5 to 4 in. wide; petiole thick .5 in. long, pubescent. Panicle dense, terminal compact, 3 in. long, 4 in. wide, pubescent; pedicel .1 in. long. Calyx pubescent mealy, .1 in. long, lobes lanceolate acute, cleft nearly to the base. Petals .75 in. long, .25 in. wide, oblong spatulate tip broad rounded, glabrescent. Stamens 15 in 2 rows. Ovary cone-shaped free from sepals, puberulous. Style short, thick ribbed; stigma rather large. Fruit (unripe) ovoid not corky. Calyx entirely covering the nut except the extreme tip, lobes thin, ovate rounded, whole fruit .75 in. long, lobes free part .1 in. long. Peninsular Siam, Klong Wang Tapoh in Renong. (Hamid No. 3787). Native name *Mai Sak*.

Perhaps nearest to *P. Stapfianus* but the leaves are thinner and have more nerves. It has larger flowers than any species I have ever seen.



#### IV. NEW AND RARE PLANTS FROM THE MALAY PENINSULA.

By H. N. RIDLEY, C.M.G., F.R.S.

This paper includes a number of new species recently received in various collections chiefly made by members of the Museums Department in the Federated Malay States and others from a collection made by myself in Kelantan in 1917 ; together with various emendations of species of earlier collections which in the course of my work on the Flora of the Malay Peninsula I have found it necessary to make.

A small but valuable collection was made on the East Coast by Mr. I. H. N. Evans, Asst. Curator, Perak Museum, of which several new species are described, besides which he added to our flora *Securidaca tavoyana*, and *Celastrus paniculata* from Pahang. The latter is a very widely distributed plant, occurring in India and throughout the Malay archipelago, but curiously has been till now missing from the Malay Peninsula.

A small collection made by a native employé of the F.M.S. Museums Department on Gunong Bintang on the Kedah-Perak boundary contained a number of valuable additions including a remarkable new Genus of *Rhanmaceae*, viz. :—*Oreorhamnus*.

On the invitation of Mr. and Mrs. Graeme-Anderson I visited Kelantan in February 1917, and enjoyed their hospitality for some weeks at Chaning Estate on the Kelantan river above Kuala Lebir, and on my way back stopped with Mr. R. J. Farrer at Kota Bharu. The flora of Kelantan was very little known. I formerly received a number of specimens and live plants from Dr. Gimlette at Kuala Lebir, and had landed once in 1889 on the sea coast near the mouth of the Kelantan river for a few hours. Near the Chaning Rubber Estate were patches of forest untouched by man and here I found the flora typically Malayan, but with a good many new species. Here in a sandy spot in a forest I found a patch of *Trichopus Zeylanicus* which I had met with many years ago at one spot in the Tahan woods in Pahang ; otherwise it is only known from Ceylon.

A day or two at Kuala Lebir gave me a curious Rubiaceous shrub obviously of the same genus as a dwarf shrubby plant collected by me at Klang gates and which I had referred to *Xanthophytum* Bl. Further examination showed that it did not belong to Blume's genus and I have made a new genus *Aleisanthia* for the two species : it is allied to the genus *Grania*. Curiously I found a true *Xanthophytum* on the banks of the Pehi river opposite Chaning Estate, another generic addition to our flora. The country round Kota Bharu is mostly covered with rice fields and other cultivations. I noticed here plots of *Coleus tuberosus*, a plant seldom cultivates further south. I

ascended the only large hill in the neighbourhood which was called simply Gunong and added a number of interesting plants from this rather dry rocky place. Near the village Tumpat was some open heath country, very sandy : The flora was more distinctly Siamese, and I found here the Anonaceous shrub *Rauwenhoffia*, a typically Siamese and Cambodian plant. The sandy shores at the mouth of the Kelantan river were rather disappointing, the chief plants there being *Casuarina*, *Spinifex*, *Dodonaea*, and the usual common sand-hill plants : but I found also a new species of *Waltheria* which was very interesting as the genus is mainly South American, and the only species in our area (and it is scarce) is *W. americana*, believed to have been accidentally introduced into Asia from South America.

I was much indebted to Mr. and Mrs. Graeme-Anderson, to Mr. Farrer and to Dr. Geale of Kuala Lebir for their hospitality through which alone I was enabled to collect the plants of this little known district.

#### CAPPARIDACEAE.

##### 1. *Capparis pubiflora*, var. *perakensis*, King.

This plant is only known from specimens collected in Perak by Scortechini. I have recently found it again in the woods surrounding the Channing Estate on the Kelantan river. It seems to me sufficiently distinct from *C. pubiflora* DC., a native of Timor and Celebes, of which, however, I have only seen rather poor specimens. The bracts in this species are broad, soft and woolly, and the flowers much more woolly than in our species which has also short subulate persistent bracts quite glabrous. The young shoots and just opened leaves are thickly pubescent, and the whole flower bud pubescent but not as densely as in the Timor plant. I think it advisable to keep it as a separate species under the name of *C. perakensis*.

##### 2. *Capparis paniculata*, sp. nov.

A long, much branched but slender thorny climber with very short decurved thorns thickened at base and black at tip .1 in. long. Leaves thinly coriaceous, oblong base blunt tip acute, nerves 5 pairs, 5.5 in. long, 2.5 in. wide, petiole .15 in. long. Flowers in a lax terminal panicle 6 in. long, peduncle .75 in. long, slender terminated by an umbel of about 6 flowers ; pedicels .5 in. long, slender. Flowers white .25 in. across. Sepals rounded, oblong, outer pair boat-shaped, coriaceous, inner pair larger with a broad thin margin. Petals oblong rounded connate at base. Stamens numerous little longer than the petals ; white. Anthers oblong, short. Gynophore little longer than the filaments, ovary conic.

Kelantan in dense forest in the neighbourhood of Channing Estate on the Kelantan River. Feb. 1917.

*Distrib.* Borneo : Foot of Mt. Braang (Limestone), Sarawak (Haviland 766).



## DIPTEROCARPACEAE.

3. *Balanocarpus ovalifolius*, *sp. nov.*

Tree. Leaves thin coriaceous ovate, cuspidate, base round shortly acuminate, tip blunt, nerves fine about nine pairs, often very inconspicuous, midrib elevate often on both sides reticulations minute but conspicuous 3 in. long, 1.5 in. wide, petiole slender .5 in. long. Panicles lax, glabrous, drying black, 2 in. long, rather few flowered. Flowers considerably larger than in *B. Curtisii*. Sepals imbricate subcoriaceous, glabrous blunt. Petals twice as long .15 in. long, oblong, blunt mealy pubescent outside. Stamens 15, filaments short and rather broad; anthers subglobose, appendage hair-like, longer than the rest of the stamens. Ovary with stout cylindric stylopodium, glabrous.

Penang : Ayer Hitam at 300 ft. (Haniff 3727, Curtis 426). Malay name "Pinang Baik."

This plant was originally tentatively assigned to *B. laitfolius* Brandis, a Bornean species, by Brandis; but it differs entirely in the venation of the leaves which is exactly that of *B. Curtisii*. From that species it differs in the broad ovate leaves and larger flowers and more oblong longer sepals.

## STERCULIACEAE.

4. *Waltheria arenaria*, *sp. nov.*

Prostrate, creeping shrubby plant 2 ft. long, twigs slender, tips tomentose. Leaves ovate elliptic, base broad, edge serrate tomentose, thickly beneath, thinly above when adult nerves thick elevate 3-4 pairs .5-.75 in. long, .25-.3 in. wide; petiole .25 in. long, stipules linear. Heads of flower .3 in. wide, sessile, densely villous. Bracts linear villous. Calyx obconic strongly nerved, villous, lobes 5 subulate. Corolla .25 in. yellow, petals linear oblong spatulate long clawed. Stamens 5 with very short filaments connate at base. Style slender stigma penicillate, pericarp tomentose at top. Capsule smooth brown 1 seeded.

Kelantan in sand on the sea shore beneath the Casuarinas at Kuala Kelantan. Abundant.

An interesting find as *W. indica* L., the only other Asiatic species, is a tropical weed probably like most of the genus of American origin. It is an erect plant and is not common in the Malay Peninsula being only known from Malacca where Griffith collected it.

## RUTACEAE.

5. *Glycosmis elata*, *sp. nov.*

Tall shrub 6-8 ft. high. Leaves 18 in. long of 4 leaflets irregularly spaced oblong elliptic 7 in. long, 2 in. wide, pale beneath; 5-7 nerved, nerves strongly inarching, petioles .25 in. long. Flowers in short axillary panicles 3 in.

long, rather numerous .1 in. long, white. Sepals small 5. Petals .1 in. long, oblong glabrous. Stamens 10 unequal outer 5 as long as petals, inner 5 shorter. Ovary flask-shaped, glabrous; style rather stout. Fruit small, ovoid beaked, yellow spotted brown.

Damp woods in Kelantan at Chaning and in the Glam wood near Kota Bahru.

It seems most nearly allied to *G. sapindoides*, Wall. of Penang Hill, differing in larger flowers, glabrous pistil and unequal stamens. The leaves are thickly black-dotted on the back.

6. *Zanthoxylum hirtellum*, *sp. nov.*

Climber, armed with short decurved thorns, shortly rough-hairy. Leaves 6 in. long. Leaflets 7-9, coriaceous, elliptic, blunt cuspidate, edge crenulate or undulate, hairy beneath on a rather slender thorny rachis, midrib thorny, 2.5-3 in. long, 1.25-1.5 in. wide; nerves about 8 pairs; petiolules .1 in. long or less. Panicles axillary 2-3 together, slender 2 in. long, few flowered. Flowers .1 in. wide. Fruit spikes 3 in. long, pubescent, with short branches. Coccus oval pubescent wrinkled .25 in. long. Seed slightly flattened smooth black shining nearly .25 in. long.

Singapore : Yo Chu Kang (Ridley 11291). Pahang : Temerloh (Ridley). Dindings : (Curtis), Lumut (Ridley 10281). This plant is covered with short rough hairs. It is near the Javanese *Z. Horsfieldii*, Turcz. and *Z. nitidum* of China and Cochin-China, but these are glabrous.

GERANIACEAE.

7. *Connaropsis sericea*, *sp. nov.*

A tree. Leaves thinly coriaceous, oblong sharply acuminate base round, nerves 8 pairs, slender but prominent beneath subglaucous beneath, reticulations conspicuous 7-7.5 in. long, 3 in. wide; petiole rather stout, .5 in. long. Panicles raceme-like from the upper axils 12 in. long, branches .25 in. long, puberulous. Sepals ovate, blunt silk tomentose. Petals oblong, clawed, upper part deep red, claw pale .1 in. long. Stamens shorter filaments very slender; anthers ovate with wide cells. Styles short, free.

Pahang : Pianggu, Endau River (Evans). Flowers red. Aug. 1917.

A very distinct species with large leaves as big as those of *C. macrophylla* but much thinner and subglaucous beneath, the panicles long, slender puberulous with silky tomentose sepals.

RHAMNACEAE.

Genus *OREORHAMNUS*, *gen. nov.*

A shrub or tree? erect. Leaves alternate lanceolate dentate. Flowers small axillary hairy calyx campanulate lobes 5 triangular. Petals minute spatulate bilobed



enwrapping anthers stamens 5 opposite petals, filaments rising from a thin disc lining the calyx tube, ovary free 3 lobed, ovules 1 in each cell. Styles 3. Species one.

8. *Oreorhamnus serrulatus*, *sp. nov.*

Shrub or tree, erect. Buds red hairy. Leaves alternate thinly coriaceous lanceolate narrowed to both ends, dentate serrulate glabrous, nerves 6 pairs with midrib elevate beneath, sunk above, reticulations very close on both sides very fine, 3 inches long, 1 in. wide, petiole .5 in. long pubescent when young. Flowers very small axillary on the young shoots, hairy pubescent shortly pedicelled. Calyx campanulate lobes 5 triangular acute hairy outside. Petals very small spathulate bilobed, lobes rounded, glabrous enclosing the anther. Stamens 5, opposite petals and enwrapped therein, filaments slender rising from a very thin disc lining the calyx tube. Anthers ellipsoid, dehiscing longitudinally. Ovary 3-lobed free to base, hairy; ovules 1 in each cell. Styles 3 short cylindric truncate. Fruit not seen.

Kedah-Perak boundary: Gunong Bintang (Native Collector, F.M.S. Mus.).

SAPINDACEAE.

9. *Lepisanthes hirta*, *sp. nov.*

Simple tree-like shrub. Branches, underside of leaves, rachis, midrib above and inflorescence softly hairy. Leaf over 2 ft. long, leaflets 10, alternate but approximate elliptic lanceolate shortly acuminate; nerves about 18 pairs, 12 in. long, 4 in. wide membranous, petiolule thick .15 in. long. Panicles axillary 4-5 in. long branches few distant, racemose. Flowers .1 in. wide. Sepals, 5, orbicular, coriaceous, pubescent, edge ciliate. Petals 4, ovate round blunt nearly twice as long, glabrous, scales at base oblong, white, woolly. Stamens 8, short within the undulate disc, glabrous. Rudimentary pistil densely hairy.

Kelantan: Chaning Forest.

A remarkably hairy species, most of the genus being nearly glabrous except the inflorescence. A plant got on the Pehi River had much smaller oblong, blunt leaflets 5.5 in. long by 2 in. wide.

LEGUMINOSAE.

10. *Vigna hirtella*, *sp. nov.*

Stems slender, hairy. Leaves, petiole 2 in. long slender hairy; leaflets ovate acuminate, the lower ones somewhat rhomboid, obscurely lobed, nerves fine, hairy beneath, 2 in. long 1-1.5 in. wide, petiolule of mud-leaflet .5 in. long. Peduncle hairy, slender. Flowers few .5 in. long, yellow. Bracts at base linear acuminate. Calyx campanulate with short broad equal teeth. Standard obovate, round, broad with 2 short points at base by claw, wings broadly round

at tip, keel short, broad. Stamens slender. Style plumed on lower edge at tip. Ovary glabrous. Pod narrow linear glabrous 2 in. long 1 in. wide.

Kelantan : Bank of River Lebir near Chaning.

*Distrib.* Timor Laut (Riedel in Herb. Kew).

One of the plants commonly confused with *V. luteola*, Benth., a South American plant. The fruit is described from the Timor Laut plant which is I think the same species, the pod however, is not ripe.

11. *Crudia Evansii*, *sp. nov.*

Climbling plant, glabrous. Leaves 6 in. long including petiole. Leaflets 3-4, thin, coriaceous elliptic shortly acuminate 6-nerved ; nervules nearly as conspicuous, reticulations distinct, 4 in. long, 2 in. wide, petiolules .2 in. long. Racemes dense, scurfy velvety red, 2 in. long, rachis thick. Flowers crowded, shortly pedicelled. Sepals ovate, blunt .1 in. long. Stamens 10, glabrous. Pistal conic, densely hairy.

Pahang : Gunong Senyum (Evans). "Climbing plant anthers yellow, petals inconspicuous. Sepals brownish." January 1917.

MYRTACEAE.

12. *Eugenia jasminifolia*, *sp. nov.*

Small tree. Leaves thin, coriaceous ovate, blunt caudate base cuneate nerves numerous parallel but invisible above and always so beneath, 1 in. long .25 in. wide ; petiole .1 in. long. Flowers small in sessile terminal and axillary clusters about 5. Bracts broad, oblong papery. Calyx oblong cylindric slightly narrowed at the base .12 in. long ; lobes rounded broad persistent. Petals free, rounded. Stamens very short.

Negri Sembilan : Tampin Hill (nat. coll. F.M.S. Mus.).

Allied to *E. tecta*, King, in its small sessile heads but the leaves are quite different and the flowers very small.

13. *Eugenia laxiuscula*, *sp. nov.*

Bark of twigs red. Leaves narrow, oblong, lanceolate acuminate base cuneate, nerves numerous subparallel faint 6.25 in. long, 1.9 in. wide petiole .25 in. long. Panicles wide, spreading, 6 in. long, 4 in. wide, lax. Calyx lobes distinct, short rounded semielliptic, tube goblet-shaped with a rather long pseudo-stalk .2 in. long. Corolla calyptrate. Stamens very numerous .4 in. long.

Pulau Butang, Butang Ids, West of Langkawi Ids. (Curtis 975).

King refers this number to *E. inophylla*, Roxb., from which it differs in its longer, narrower leaves with fewer nerves, its red bark wide panicle, longer calyx-tube and distinct lobes (quite absent in *inophylla*) and its stamens



twice as long. It has the habit of the Javanese *laxiflora*, Bl., but the calyx tube of that is remarkably short and round.

14. *Eugenia Evansii*, *sp. nov.*

Branchlets dark brown. Leaves thin, coriaceous, elliptic to oblong abruptly acuminate base very shortly cuneate, nerves very numerous faint horizontal, intramarginal one close to edge 6 in. long 2·75 in wide; petiole ·2 in. long. Cymes terminal and in upper axils short, branches angled spreading ending in 3-5 sessile flowers, 1·5 in. long and wide. Flowers small. Calyx broad, goblet-shaped with a pseudostalk, lobes 0. Petals calyptrate very small. Stamens fairly numerous very short, white, ·1 in. long. Style as long.

Pahang : Gunong Senyum (Evans).

One of the *Syzygium* section but unlike any known to me.

15. *Eugenia Graeme-Andersoniae*, *sp. nov.*

Tree. With long pendent branches. Leaves thin, coriaceous, narrow lanceolate long acuminate both ends pendent; very finely parallel-nerved, 4 in. long ·75 in. wide, petiole ·15 in. long. Cymes axillary 1-2 in. an axil, 3 or 4-flowered 1 in. long or less. Peduncle and branches rather stout, angled. Bracts minute, triangular acuminate. Calyx obconic with very short points, ·25 in. long. Petals free rounded, ·15 in. long white. Stamens very numerous, fine with very small anthers, about ·5 in. long.

Kelantan : Chaning, along the river bank. Abundant.

A very handsome tree, remarkable for the flowers being in small cymes in the axils of almost every leaf. The leaves hang down, the flowers standing erect on the spreading and pendulous branches.

I have much pleasure in associating this beautiful tree with Mrs. Graeme Anderson through whose hospitality at Chaning Estate I was enabled to make extensive collections in this hitherto botanically unexplored part of Kelantan.

16. *Barringtonia pedicellata*, *sp. nov.*

Branches slender. Leaves membranous, broad, lanceolate acuminate, narrowed to base; denticulate, nerves slender 10 pairs, 6 in. long, 2 in. wide, petiole ·2 in. long. Raceme terminal, slender 12 in. long. Flowers distant pedicels slender ·4 in. long. Bracts oblong blunt ·1 in. long. Calyx tube campanulate lobes ovate, blunt ·12 in. long. Corolla ·5 in. across; lobes oblong. Stamens twice as long. Style ·4 in. long.

Pahang : Labong, Endau River (Evans, Aug. 1917).

Allied to *B. spicata*, Bl., but the flowers are borne on long slender pedicels as in *B. fusiformis*, King; the leaves are exactly those of *B. spicata*. Ripe fruit I have not seen but in the quite young state it appears to be winged.

## MELASTOMACEAE.

17. *Sonerila barbata*, *sp. nov.*

Stem woody, erect, stout 14 in. tall, densely brown, hairy. Leaves obovate to oblanceolate membranous sub-acute, base blunt unequally bilobed glabrous, 5-nerved from base, transverse nerves subhorizontal, 6-8 in. long 2.75 to 3 in. wide ; petiole 1 in. long, thick, densely brown, hairy. Cymes in upper axils 1.25-3 in. long ; peduncle slender, hairy. Flowers secund, about 15 mauve. Capsule campanulate not angled, pustular 25 in. long ; pedicels densely hairy .12 in. long.

Kelantan : Chaning Woods.

The leaves are spotted with white.

## BEGONIACEAE.

18. *Begonia barbellata*, *sp. nov.*

Whole plant 14 inches tall. Stem somewhat woody, glandular hairy. Leaves membranous obliquely lanceolate acuminate, irregularly crenate-serrate, base narrowed to a blunt tip, above glabrous except for a few scattered hair-like trichomes, beneath hairy on nerves and edge ; nerves slender 4 pairs, 5 in. long, 1.75 in. wide, petiole .1- .25 in. long. Stipules lanceolate acuminate papery, hairy ; male flowers terminal and in upper axils. Peduncle slender rising from a tuft of lanceolate acuminate hairy bracts, hairy .5 in. long. Flowers 2 or 3 white, pedicel .4 in. long. Sepals oblong rounded, hairy on the back .25 in. long. Female flowers larger usually in lower axils. Capsule oblong slightly narrowed at the base with three equal wings .4 in. long .25 in. wide.

Kelantan : Chaning Woods. Very local.

This is certainly allied to *B. pubescens*, Ridl. of Sarawak, but to nothing in the Malay Peninsula ; from that species it differs in its much taller size, rather larger flowers and entirely different fruit.

## CUCURBITACEAE.

19. *Hodgsonia capniocarpa*, *sp. nov.*

Big climber with strong tendrils. Leaves bright shining green, coriaceous 6 in. long 7 in. wide, palmate base cordate lobes, short, acute ; nerves beneath hairy reticulations fine conspicuous ; petiole 1 in. long. Male raceme woody, stout growing to 6 in. long. Bracts thick, ovate .1 in. Calyx-tube .5 in. long, thick, lobes very short, scurfy. Corolla tube 2 in. long, thick scurfy pubescent 2 in. across when open. Fruit 6 in. wide, depressed globose velvety-grey woody. Seeds 2 in. long imbedded in a firm oily pulp.

Pahang river (Ridley). Malacca (Maingay). Penang (Phillips Porter, Wallich 6684).



This has been referred to *Hodgsonia heteroclita*, Hook. f. of India, from which it differs in its hairy underside of the coriaceous leaves, much smaller flower with a much thicker calyx tube and shorter lobes, and its fruit. *H. heteroclita* has a pointed red fruit, thin walled. That of this species is woody, velvety, grey and quite flat at the top and base. If dropped in water it can be taken out quite dry owing to its velvety coat. It is called Akar Kapayung from the resemblance of the seed to that of *Pangium*. It is probable that it is the *Trichosanthes Kadam* Miquel of Sumatra, but his description is incomplete.

#### PASSIFLORACEAE.

##### 20. *Adenia grandifolia*, sp. nov.

Glabrous climber. Leaves membranous becoming thinly coriaceous broadly ovate elliptic acuminate, base cuneate decurrent shortly on the petiole with 2 large glands 4-6·5 in. long, 4-6·5 in. wide; nerves prominent, one pair basal, one pair above nervules transverse; petiole 1-1·5 in. long. Panicle short, branched 1·5 in. long, many flowered. Bracts lanceolate acuminate ·15 in. long. Male flowers semifusiform flask-shaped ·15 in. long. Calyx lobes recurved linear acuminate. Petals from mouth of tube as long linear acuminate recurved thinner. No corona. Stamens from base much shorter than the tube anthers, apiculate.

Pahang : Kuala Tekam and Kota Tongkat. (Evans, July 1917). Sumatra ; Ayer Mancior near Padang (Beccari 743).

The much larger leaves and large flowers clustered on a short, stout panicle make this very different from the other species.

#### ARALIACEAE.

A troublesome genus to identify from herbarium specimens as they preserve badly and we frequently get only the upper part of the plant without the lower often pinnate leaves.

##### 21. *Arthrophyllum angustifolium*, sp. nov.

Small tree. Lower leaves pinnate over 2 ft. long; leaflets 29, coriaceous linear lanceolate acuminate 6 in. long ·5 in. wide nerves faint, sunk above; petioles ·1 in. long, upper leaves simple broader and shorter, petiole slender, 1 in. long. Inflorescences axillary and terminal, peduncles 1·5 in. long or less, secondary peduncles ·25 in. Pedicels ·1 in. long. Flowers very small. Calyx very short undulate, buds short ovoid. Petals ovate valvate 4. Stamens 4.

Perak : Gunong Kledang (Ridley 9683).

Curious in its narrow leaflets and very small flowers.

**22. *Arthrophyllum congestum*, *sp. nov.***

Small tree. Leaves 10 in. or more with 11 leaflets, fleshy coriaceous oblong lanceolate acuminate base broad but shortly narrowed oblique, nerves slender, 7 pairs, very faint, 4 in. long 1.25 wide, petiolules .15-.2 in. long. Upper leaflets simple, oblong very oblique at base, 2.5 in. long 1.25 in. wide, petiole slender .25 to .75 in. long. Inflorescence axillary and terminal, peduncles 1.5 in. long or less. Flowers crowded in a head, pedicels .1 in. long. Calyx very short edge undulate. Petals 4, ovoid in bud.

Selangor : Klang Gates (Ridley 13421) : Dindings ; Lumut (Ridley 8374).

**23. *Schefflera lanceolata*, Ridl.**

*Heptapleurum avene*, King, Journ. Asiat. Soc. Bengal lxvii, part ii, p. 47, not of Miquel.

This plant seems to be quite distinct from Miquel's species in its differently shaped leaves and smaller flowers : King's description is taken from the Singapore plant. The leaves are mostly simple but when the plant grows sufficiently large, it bears at the top trifoliate leaves.

**24. *Schefflera capitellata*, *sp. nov.***

Epiphyte. The leaves 8-foliate, leaflets lanceolate acute narrowed to the base ; nerves fine coriaceous puberulous beneath 3.5 in. long, 1 in. wide, petioles 1 in. long petiole 7 in. long. Racemes scurfy tomentose 18 in. long peduncles .5 in. long, heads .4 in. through. Bracts minute and caducous (not seen). Flowers pubescent 5-angled, truncate, quite sessile. Petals connate in a cap. Stamens 6, purple.

Mountain forests :—Perak : Bujong Malacca. Penang Hill at 2,500 ft. (Curtis).

This plant has been confused with the much larger *H. cephalotes*, Clarke, which occurs on sea cliffs and banks, and has very much larger leaflets broadly oblong cuspidate and much larger panicles and the leaves are not subpuberulous beneath. In a plant I got on Penang Hill the leaflets are oblanceolate, broadest at the top. A plant collected by Wray (1542) on Ulu Batang Padang at 4,900 ft., may be this but the specimen I have seen is too young and Wray describes it as a large tree.

**25. *Schefflera Klossii*, *sp. nov.***

A large climber. Branches pale shining, young parts white, scurfy. Leaves petiole stout 2.5 in. long ; leaflets 5, elliptic abruptly acutely acuminate, base narrowed stiffly coriaceous, midrib beneath prominent ; nerves 5 pairs elevate quite glabrous, 7 in. long, 3 in. wide, basal ones smaller with shorter petiolules, petiolule of terminal one 1.4 in. long. Basal bracts of inflorescence lanceolate acuminate coriaceous scurfy narrow 1.5 in. long. Panicles 5 scurfy 9 in. long. Umbels simple, numerous, peduncles .25 in. long. Flowers small, pedicels .05 in. about 10, scurfy.



Calyx obconic, scurfy, lobes very obscure. Corolla in bud ovoid blunt .05. Petals 5 ovate blunt veined. Stamens 5. Styles combined in a truncate cone, with five minute stigmas.

Perak : Changkat Mentri. Large climber, pink and white. Sept. 1918 (Kloss 6516.)

Allied to *S. Scortechinii*, Ridl., but the leaflets are narrowed at the base, and there are no bracts to the umbels which are fewer flowered and with longer pedicels.

## RUBIACEAE.

### Genus ALEISANTHIA, gen. nov.

Shrubs. Leaves thin, coriaceous, pale or white beneath. Stipules free large, lanceolate. Racemes sometimes 2-branched in upper axils ; many flowered. Flowers small, yellow secund. Calyx subcylindric, limb campanulate, large with 5 short points. Corolla tube short, limb campanulate hairy in the mouth, lobes short 5-6. Stamens 5-6 included in the corolla, adnate to the limb. Style slender. Stigma cupulate globose. Capsule hairy, pericarp splitting into two woody carpels dehiscent on the inner face, seeds numerous minute angular reticulate.

Species 2. *A. rupestre*, *Xanthophytum rupestre*, Ridl. Journ. Straits Branch Royal Asiat. Soc. No. 54, 1910, p. 44. Selangor. *A. sylvatica* (postea). Kelantan.

This genus is allied to *Greenia* from which it differs in its axillary inflorescence, short cup-shaped corolla, clubbed style, and stamens adnate to upper part of corolla with very short filaments.

### 26. *Aleisanthia sylvatica*, sp. nov.

Shrub, 15 ft. tall hairy. Leaves lanceolate cuspidate acuminate, long narrowed to base stiff, membranous above, glabrous beneath white hairy nerves 25 pairs fine nervules transverse parallel all a little elevated 7.5 in. long 2.25 in. wide, petiole winged to base. Stipules oblong lanceolate cuspidate and shortly keeled .4 in. long. Inflorescence axillary peduncle .5 in. long with two racemes of distant secund flowers 4 in. long. Bracts linear acuminate setaceous .1 in. long very narrow. Pedicels very short hardly any. Calyx tubes cylindric slightly narrowed at the base, densely hairy, limb campanulate glabrous, large with 5 short acute points. Corolla yellow .25 in. long, tube short cylindric, little longer than the calyx then dilated to a limb, broadly cup-shaped nearly .25 in. long, all hairy outside and in, lobes very short 5 or 6 ; mouth inside densely white woolly. Stamens 5 or 6 glabrous adnate to upper part of the tube and barely projecting at all ; filaments very short. Anthers much longer, oblong linear with a short rounded appendage at the top. Style glabrous, cylindric from a conic persistent base, narrowed to the tip little longer than the corolla. Stigma large, globose. Capsule fusiform densely hairy with persistent calyx and style base, separating

into two woody fusiform carpels, which dehisce on the inner face. Seeds very numerous, small irregularly angled, reticulate, brown.

On hills in forest at Kuala Lebir above the river, Kelantan, in flower and fruit Feb. 1917.

**27. *Xanthophytum capitatum*, *sp. nov.***

Stem about 12 in. slender, woody, hairy. Leaves alternate (the second being suppressed) thin ovate elliptic acuminate acute; nerves about 18 pairs slender ascending, above sprinkled with long hairs, beneath more densely so especially on the nerves, 6.5 in. long, 3.25 in. wide, petiole slender .5 in. long. Stipules oblong cuspidate .25 in. long. Inflorescence a dense head .3 in. through on a peduncle .2 in. long all red-hairy. Bracts obcuneate toothed, bracteoles similar but smaller. Flowers pedicelled, small white. Pedicel slender, hairy as long as the calyx. Calyx tube globose, hairy, sepals triangular acuminate hairy. Ovary with a circular white disc. Fruit very small, didymous of 2 easily separate semi-globose carpels. Pericarp crustaceous. Seeds very many, minute angled.

Kelantan on the banks of the Pehi River opposite Chaning Estate Feb. 1917.

This genus has not been found in the Peninsula before. The species is remarkable for its having apparently alternate leaves, the second one of each pair being reduced to a small stipule-like organ, bearing an inflorescence in its axil, while another is produced in the axil of the developed leaf. The condensed head-like inflorescence is also unusual.

**28. *Argostemma stipulacea*, *sp. nov.***

Whole plant 9 in. to 12 in. ascending stem scurfy. Leaves membranous oblong obovate narrowed to the rounded unequal base, tip round above, glabrous, dark green with grey centre beneath nerves 15 pairs and nervules scurfy, 5 in. long 2 in. wide; petiole .25-.3 in. long, small leaf, linear oblong .5 in. long, .12 in. wide. Stipules oblong with round tip .5 in. long .2 in. wide. Peduncle 1 in. long with an umbel of three branches .5 in. long; pedicels slender .1 in. long. Calyx small obconic. Corolla in bud lanceolate, .5 in. across when open, lobes narrow lanceolate acute.

Kelantan : Kuala Lebir.

Allied to *A. rugosum*, Ridl., but with shorter petioles blunt base to leaf and much smaller narrow-petalled flowers.

**29. *Argostemma hirsutum*, *sp. nov.***

Prostrate creeping herb, hairy all over. Leaves unequal large, large one ovate acute, base round nerves 10 pairs, fine, 2 in. long, 1 in. wide; petiole .1 in. small leaf ovate .18 in. long, acute. Stipules similar. Flowers 1-2 on a very hairy terminal peduncle 1-2 in. long. Bracts whorled, lanceolate ovate, very hairy pedicels .25 in. long. Calyx campanulate, lobes lanceolate, acute. Corolla .25 in. across lobes lanceolate acute, hairy.



Kedah-Perak boundary. Gunong Bintang (nat. coll., F.M.S. Mus.).

Allied to *A. viscidum*, Ridl., but with a long creeping stem and ovate leaves. A very hairy plant.

**30. *Ophiorrhiza remotiflora*, sp. nov.**

A very thin fleshy herb about 6 in. tall, quite glabrous except the upper part and inflorescence thinly scurfy. Leaves ovate lanceolate acuminate acute base cuneate, nerves slender 12 pairs, 7 in. long, 3 in. wide or less; petiole slender 1 in. long. Inflorescence 4 in. long with several branches, the lowest 3 in. long and secund, distant flowers; pedicel .05 in. long. Calyx tubular with lobes linear acute .08 in. long. Corolla slender tubular .25 in. long; lobes short lanceolate. Stamens included. Capsule .25 in. wide slightly indented at tip.

Pahang: Gunong Senyum and Kota Tonkat (Evans).

A remarkably thin fleshy plant with the flowers wide spaced.

**31. *Hedyotis pachycarpa*, sp. nov.**

Stems stout, erect obscurely angled over 12 in. tall. Leaves lanceolate acuminate acute base, long narrowed, nerves elevate beneath ascending 8 pairs, 6.25 in. long 1.4 in. wide, petiole .1 in. long. Stipules lanceolate oblong with several stiff long bristles. Heads sessile dense axillary. Flowers shortly pedicelled. Calyx tube short lobes, long lanceolate edges ciliate acute. Corolla shorter or hardly longer white. Stamens as long; anthers linear, oblong large. Capsule globose, small smooth very hard crustaceous; pericarp thick. Seeds reniform 2-3, black.

Kelantan: Glam Woods near Kota Bahru. Indo-China: Chioskan (Pierre 2032).

Near *H. paradoxa*, Kurz of the Andamans, but that has nerveless leaves.

**32. *Diplospora minutiflora*, sp. nov.**

Tree. Leaves thin, glabrous elliptic subacute or bluntly acuminate base shortly narrowed; nerves 7 pairs slightly clevate 4-6 in. long, 2 in. wide, petiole .2 in. long. Cymes axillary on a peduncle .1 in. long. Flowers green, very small; pedicel .1 in. long. Bracts numerous minute ovate. Calyx campanulate with 4 short teeth. Corolla .1 in. long, tube very short, lobes oblong blunt valvate 4, mouth glabrous. Stamens 4, style very short, no disc. Ovary 2-celled; ovules 2 in a cell.

Kelantan: Chaning Woods.

I have no doubt that this is a *Diplospora* though the thin leaves, minute style and absence of any hair in the corolla mouth are unusual characters.

**33. *Randia hirsuta*, sp. nov.**

Straggling shrub. Erect, 10 ft. tall, branches, back of leaf, petiole and calyx densely tomentose. Leaves lanceolate

rather thin acute base, narrowed but blunt ; nerves sunk above, elevate beneath, 4 in. long 1·25 in. wide ; petiole ·25 in. Stipules linear setaceous hairy. Flowers terminal 1-3 together, white, on very short pedicels. Calyx ovoid, very hairy, ·12 in. long. Sepals 5, linear acuminate ·25 in. long. Corolla tube sparsely pubescent, 1·25 in. long, very narrow cylindric, lobes narrow oblanceolate 1 in. long ·15 in. wide narrowed to base, glabrous. Anthers exsert.

Kelantan : Chaning Woods.

I do not know anything at all like this.

**34. *Tarenna glabra*, *sp. nov.***

Shrub, 3-4 ft. tall, glabrous. Leaves membranous lanceolate acuminate, base narrowed cuneate nerves, about 11 pairs elevate beneath 7 in. long 3 in. wide ; petiole ·5-1 in. long. Stipules short broadly triangular cuspidate ·25 in. long. Cyme ·75 in. long, very shortly peduncled. Flowers subsessile greenish white. Calyx cup-shaped, lobes very short, ovate. Corolla ·4 in. long, tube shorter than limb, lobes imbricate not twisted, linear oblong blunt, mouth of tube inside woolly. Anthers sessile linear with a short subulate point. Style rather stout, upper slightly dilate, hairy. Stigma clubbed. Ovary 2-celled, ovules 2 in a cell.

Kelantan : Chaning Forests.

This plant has the appearance of *T. stellulata* but the corolla is blunt and quite glabrous.

**35. *Canthium depressinerve*, *sp. nov.***

Shrub with pubescent branches, axillary spines ·25 in. long. Leaves coriaceous ovate acuminate, base rounded ; nerves 4 pairs elevate beneath, sunk above, glabrous above but minutely dotted, sparsely hairy beneath ; nerves thickly hairy 2·5 in. long, 1 in. wide, petiole ·05 in. long. Stipules broad triangular with a subulate point. Flowers not seen, but apparently the cyme is small and not peduncled. Fruit obpyriform, very fleshy, ·5 in. long when dry, pedicel ·1 in. long. Pyrene very hard bony 1-seeded ribbed outside.

Kelantan : Chaning.

Undoubtedly near *C. macrocarpum*, Thw. of Ceylon but that has a pedicelled cyme.

**36. *Ixora candida*, *sp. nov.***

Small shrub 4 ft. tall. Leaves lanceolate acuminate, both ends coriaceous, nerves fine elevate beneath 11 pairs, bluntly or acutely acuminate 3-4·5 in. long, ·75-1 in. wide, petiole ·1-·2 in. long. Stipules coriaceous lanceolate ·2 in. subulate, corymbs 1·5 in. long lax puberulous, peduncle very short ·5 in., slender. Flowers about 20, white. Calyx ·05 in. with short acute teeth. Corolla tube ·75 in. long, very slender almost filiform, lobes ·2 in. linear narrow, in bud acuminate. Style filiform, long exsert.

Lankawi islands : Dayong Bunting (Robinson 6219). Terutau Id. at Telok Wau (Robinson).



This pretty little species is remarkable for its very narrow coriaceous leaves which do not dry black as is almost invariable in white-flowered species, and in small lax corymb of very slender white flowers with narrow petals. It is perhaps nearest to *I. plumea*, Ridl.

**37. *Ixora pumila*, *sp. nov.***

Dwarf plant about 12 in. tall ; stem pubescent. Leaves obovate to oblanceolate, tip blunt or subacute, base usually narrowed, blunt, glabrous above, pubescent beneath, 7 in. long, 3 in. wide, nerves 15 pairs. Stipules ovate blunt with a stout subulate process running from the back 13 in. long. Corymb 3 in. wide on a pubescent peduncle 3.5 in. long. Bracts narrow, linear acuminate. Calyx lobes linear acuminate .12 in. long, much longer than the ovary, pubescent. Corolla tube slender 1 in. long, glabrous, lobes oblong, all white, limb .15 in. wide. Stamens exsert, brown.

Pahang : Gunong Senyum (Evans).

Allied to *I. clerodendron*, Ridl., but a dwarf plant with very narrow linear sepals.

**38. *Timonius peduncularis*, Wall., sub *Guettarda peduncularis*, Cat. 6220.**

This is the plant included under the name of *T. jambosella*, Thw. of Ceylon by Hooker and King. It is very distinct in its larger leaves hardly hairy on the midrib and smaller, less hairy flowers. There are at least 2 species of this genus in Ceylon included under *T. jambosella*.

**39. *Prismatomeris Malayana*, *sp. nov.***

*P. albidiflora*, King and Gamble Journ. Asiat. Soc. Bengal lxxiii, 3 (1904), p. 90 : not of Thwaites.

The type of *P. albidiflora* to which this is referred by King and Hooker is a totally different plant with a much larger shorter corolla and large calyx. It is peculiar to Ceylon. The Indian species also referred here seems to me to be a different plant. There is a specimen from Ceylon in Herb. Kew which somewhat resembles *P. malayana* but the flowers are larger : it is not *P. albidiflora*, Thw.

*P. malayana* occurs in Cambodia, Borneo and Sumatra and all over the Malay Peninsula.

**40. *Psychotria vulpina*, *sp. nov.***

Shrubby stems red hairy. Leaves membranous, elliptic lanceolate acuminate, base narrowed, nerves 12 pairs ascending glabrous above densely hairy on the nerves and less so on the surface, 5 in. long, 1.75 in. wide, petiole thickly hairy .25 in. long. Stipules oblong, acuminate hairy outside to base .75 in. long, .25 in. wide. Flowers not seen. Peduncle in fruit 3 in. long, slender hairy, branches 1 in. long with 2 or 3 secondary branches. Fruits elliptic, glabrous shortly stalked about .12 in. long. Seed 5, ridged outside, flat inside.

Kelantan : Kuala Lebir.

This might be *P. multicapitata*, King which I have not seen except that stipules are very much larger and the fruits very much smaller.

**Amaracarpus, Bl.**

This is a genus of bushes rarely trees, generally foetid as in *Saprosma* and *Mephitidia* with small leaves rather crowded, small tubular flowers axillary or terminal, one or 2 together. Fruit generally blue, pulpy one or two seeded, crowned by the enlarged calyx lobes. Some of the species have been put into *Saprosma*, and I think *Neoschimpera*, Hemsl., a Seychelles plant is the same genus. The species known to me are *Amaracarpus pubescens* Bl., Java : *A. misrophyllus* Miq., Celebes : *A. saxicola* : *Saprosma saxicola*, Ridl. (Journ. Straits Branch Royal Asiat. Soc. No. 61, 1912, p. 22), in limestone rocks at Kamuning, Perak : *A. nativitatis* Bak. fil., Christmas island.

**41. *Amaracarpus caudatus*, sp. nov.**

Small glabrous foetid tree. Leaves ovate lanceolate caudate mucronulate, base shortly cuneate and obscurely unequal thin coriaceous, nerves fine 6-8 pairs, inarching, nervules and reticulations nearly as prominent .2 in. long, .5-.75 in. wide, petiole .05 in. long. Stipules very small with 1 point. Flowers in axillary pairs sessile. Calyx small short, teeth acute 4 in. long. Corolla white cylindric tubular .25 in. long, lobes short blunt, 4. Stamen 4. Ovary 3-celled. Fruit blue 1-2 seeded .25 in. long. Seeds plano-convex.

Perak ; Birch's Hill, Taiping Hills (Wray 670).

A small tree with foetid smell like carbon bisulphide. Flowers white. Fruit blue. August 1885.

**42. *Lasianthus Kurzii*, Hook. fil.**

This was based on a plant collected by Wallich in Burmah, No. 8310, 8311, of his collections. No. 8311 was written up by him Penang ? and on the strength of this has got into our Flora : I have not seen any specimen from the Malay Peninsula. Allied to it, however, is a species described by King and Gamble in the "Materials" for a flora of the Malay Peninsula as *Kurzii* but they seem doubtful about it. It is a native of Singapore : Garden jungle (Ridley 140) and Pasir Panjang. It seems to me abundantly distinct in its much more hairy habit, the branches are appressed yellow-hairy, the inflorescence and leaves also very hairy. The Burmese plant though not glabrous has none of this long yellow appressed hair, and the leaves appear to have been thinner in texture.

**43. For the Singapore plant as described by King and Gamble (Journ. Asiat. Soc. Bengal, lxxiii, 2 (1904), p. 119) I propose the name of *Lasianthus chryseus*, Ridl.**

Allied to this plant is another I recently found at Tebong in Malacca, which differs in the more acuminate thin leaves,



the midrib of which above is hairy and the much longer petiole. It also possesses distinct stipule-like bracts.

44. *Lasianthus mollis*, *sp. nov.*

Shrub with slender branches densely covered with appressed yellow hairs. Leaves membranous lanceolate acuminate, base narrowed acuminate above glabrous except the midrib covered with yellow hair beneath the nerves 6-7 pairs and nervules yellow, hairy 3.5 in. long, 1.25 in. wide, petioles slender .25 in. long, hairy. Stipules triangular lanceolate acuminate. Cymes sessile few flowered, much shorter than the petiole. Bracts lanceolate acuminate, hairy. Flowers sessile 2-3 in. a cyme white. Calyx lobes short lanceolate, hairy. Corolla much longer .15 in. long, glabrous, tube cylindric dilate at top, lobes 4, recurved ovate blunt, much shorter. Stamens exsert 4.

Malacca : Tebong (in Woods), Jan. 1917.

45. *Lasianthus velutinus*, *sp. nov.*

Shrub 3 ft. tall, densely covered with soft yellowish spreading hairs, except the upper side of the leaves. Leaves obovate to elliptic, shortly acuminate, base narrowed cuneate nerves elevate beneath 8 pairs, strongly hairy 4-6.5 in. long, 2-2.75 in. wide, petiole .15 in. long. Stipules ovate. Cymes acuminate hairy sessile as long as petiole densely hairy. Bracts lanceolate persistent .15 in. long. Calyx short, sessile, lobes lanceolate acuminate, hairy. Corolla not seen. Fruit when dry .2 in. long obovoid hairy, crowned by the hairy sepals.

Kelantan : Chaning Woods.

This is near *L. chryseus* Ridl. and *L. politus* Ridl. but the leaves are more obovate and thin.

# COMPOSITAE.

46. *Vernonia rupicola*, *sp. nov.*

Herb, base of stem woody glabrous except the young shoots which are mealy tomentose. Leaves membranous lanceolate obscurely bluntly serrate or nearly entire mostly at base of stem subacute long narrowed to the winged petiole 5 in. long, 2 in. wide or less. Cymes of heads axillary 2-3 heads together or terminal, peduncles 1.25 in. long. Heads in fruit .25 in. wide .5 in. long. Bracts lanceolate mucronate chaffy with numerous ones much smaller at base. Pappus white .2 in. long, achenes narrow, ribbed hairy, oblong.

On rocks at Pulau Butang, Butang Ids. near Langkawi Ids. (Ridley No. 15 683). Unfortunately this plant was almost dried up and quite out of flower.

*Vernonia arborea*, King includes 2 species neither being the original south Indian species of Buchanan Hamilton ; one is *V. javanica*, DC., the other a taller glabrous tree is the *Conyza acuminata*, Wallich. which I call now *V. Wallichii* (postea).

47. *Vernonia javanica*, DC.

Prodr. V. 21, is a low rather stout branching tree branches tomentose. The leaves elliptic base round tomentose beneath 3-4 in. long, 1.75 to 2 in. wide, petiole .25 in. long tomentose. Panicle 6 in. long and wide tomentose. Bracts ciliate.

Occurs in open country in Singapore, Malacca, Pahang, Selangor, the Dindings and Penang. Also in Java and Borneo.

48. *Vernonia Wallichii*, *sp. nov.*

An erect more slender tall tree 60 ft. tall. Leaves thinner elliptic acuminate base narrowed quite glabrous .3 to 6 in. long, 1.5 to 3 in. wide, petiole slender .5 in. long glabrous. Panicle 7 in. long and wide tomentose. Bracts not ciliate.

Common in forests all over the Peninsula. Also in Siam and Borneo.

## ERICACEAE.

49. *Diplycosia microphylla*, Becc.

The *Vaccinium microphyllum*, King and Gamble is a very distinct little plant occurring on Mount Ophir and Kedah Peak in the Peninsula and Matang in Borneo. The plants referred to it by King and Gamble from Perak are quite distinct, but the specimens I have seen are poor.

50. *Diplycosia elliptica*, *sp. nov.*

Epiphyte, 5-8 ft. long, branches pubescent, not bristly. Leaves entire, elliptic rounded at both ends, with no or very few bristles at the tip on the edge; nerves one pair at base running nearly the whole length of the leaf, sunk above invisible beneath .5-.75 in long, .2-.5 in. wide; petiole very short. Pedicel of solitary axillary flower .05 in. long. Calyx lobes ovate acute. Corolla campanulate, white or pale green.

Perak : Larut Hills at 3,000 to 4,000 ft. (Kunstler 6390), Gunong Batu Putih at 3,400 ft. (Wray 470).

*D. microphylla* has much closer set smaller serrate leaves with bristles on the serrations and the stem bristly. The calyx lobes are much less deeply cut.

51. *Diplycosia cordifolia*, *sp. nov.*

Branches slender, 4 angled red, tomentose. Leaves entire ovate cordate minutely, base broad round edge sparsely bristly nerves 2, sunk above .5 in. long .4 in. wide, petiole very short. Peduncle decurved .1 in. long. The flowers are all fallen in my specimen.

Pahang : Wray's Camp, Gunong Tahan, 3,300 ft.



52. *Diplycosia erythrina*, King and Gamble is *Vaccinium erythrinum*, Hook. fil., Bot. Mag. t. 5688.

It is not a *Diplycosia* but a *Vaccinium* closely allied if not identical with *V. Waringiaefolium* of Sumatra and Java. Wray's Perak specimen at Kew is very incomplete. "Gunong Bubu. Stunted tree, fruit claret-coloured 3816." It is possible it may be *Vaccinium erythrinum* which does have a few solitary axillary flowers as this does, besides the long showy terminal racemes, which are missing in Wray's specimen, I am however, not at all certain of its identity.

#### APOCYNACEAE.

53. *Melodinus cymosus*, *sp. nov.*

Leaves thin, coriaceous chartaceous, elliptic abruptly blunt cuspidate base, shortly cuneate, nerves about 40 pairs, very slender parallel, secondary nerves as prominent as main nerves 4·25 in. long, 2 in. wide, petiole ·6 in. long. Cymes lax, few flowered, spreading, peduncle ·5 in. long, cyme ·75 in. long. Bracts minute lanceolate acute, pedicels ·12 in. long. Flowers ·25 in. long, dull yellow. Calyx-lobes 5 rounded. Corolla tube dilate at base, narrowed upwards lobes ovate 5, entire. Scales oblong forked. Anthers small elliptic with a short apiculus. Style short and stout.

Malacca. Selangor forest (Burkill 789)

"Flowers dull yellow, face in a variety of ways, found open at midday, April 7, 1915.

Distinct in its lax subterminal cymes. The flowers were in a poor condition, every one I examined having been infested by a dipterous larva, but I cannot find anything like it.

#### ASCLEPIADACEAE.

54. *Dischidia viridiflora*, *sp. nov.*

Long slender creeping glabrous plant rooting at distant points. Leaves fleshy lanceolate acuminate blunt base narrow, nerves invisible, ·75 in. long, ·25 in. wide, petiole ·1 in. long. Peduncle ·15 in. long, raceme ·1 in. long. Flower ·15 in. long, pedicel very short. Sepals very short lanceolate linear blunt. Corolla flask-shaped, base wide gradually narrowed to the tip, green turning pink, glabrous within, lobes short, subacute. Corona O. Staminal column stout, wings rather large coriaceous yellowish.

Kelantan : Chaning.

As in *D. parviflora*, Ridl., I am quite unable to see any trace of the corona.

55. *Dischidia ericaeflora*, *sp. nov.*

Long climber with internodes over 4 in. long. Leaves fleshy lanceolate or ovate lanceolate acuminate blunt, base round nerves faint 2 pairs from the base,

2.25 in. long 1 in. wide at base. Racemes 2 divaricate from the top of a peduncle .25 in. long, and elongated to .5 in. Bracts round very numerous papery. Flowers apparently white, subglobose campanulate .15 in. long, pedicel shorter. Calyx lobes ovate blunt. Corolla conic, swollen at base, globose, narrowed upwards, lobes ovate acute deep cleft glabrous within. Corolla scales with a rather long slender pedicel, the top subovate with two long narrow curved arms nearly as long as the pedicel. Staminal column short, blunt conic, anther wings fleshy rather narrow, pollinia oblong, ellipsoid, carrier minute.

Kedah-Perak Boundary : Gunong Bintang (nat. coll. F.M.S. Mus.).

#### MYRSINEAE.

**56. *Maesa ovocarpa*, *sp. nov.***

A large shrub, glabrous. Leaves ovate blunt or sharply acuminate edge dentate thin textured, nerves 8 pairs beneath pale 6 in. long, 4 in. wide, petiole 1 in. long. Inflorescence of several slender racemes 1.5 in. long on a very short peduncle. Flowers rather distant, pedicel short. Sepals 4, ovate denticulate, not striate or glandular. Fruit ovoid stalked, narrowed to base .2 in. long, crowned by the enlarged sepals.

Kelantan : Chaning.

Allied to *M. striata*, but with very different fruits.

**57. *Maesa arborea*, *sp. nov.***

Small tree. Leaves coriaceous smooth, ovate acuminate, base round edge obscurely undulate, nerves 10 pairs slightly elevate 4-7 in. long, 2-3 in. wide, petiole .5 in. Panicles thyrsoid 3-4 in. long, branches .5 in. long, densely floriferous. Flowers white, very shortly pedicelled, pedicels much shorter than calyx, numerous crowded. Sepals 5, denticulate striate ovate. Petals 5 round. Stamens adnate to corolla base. Style short and stout.

Kelantan : Woods on the Pehi River, Chaning.

**58. *Maesa striata* *var. dissitiflora*, *var. nov.***

Shrub. Leaves thin, membranous elliptic acuminate, base narrowed, blunt edges undulate to bluntly serrate, nerves slender .5 in. long. Inflorescence of 2 or 3, very slender, fascicled racemes 2 in. long with remote flowers on slender pedicels .1 in. long, much longer than the calyx. Sepals 5, lanceolate, acute, 3 ribbed, not toothed. Petals oblong, rounded. Stamens adnate near the base.

Kelantan : Kuala Lebir.

#### OLEACEAE.

**59. *Jasminum arenarium*, *sp. nov.***

Slender climber with pubescent branches. Leaves lanceolate acuminate, base round, velvety beneath when



young, glabrous when adult, membranous, nerves 4-5 pairs, slender, 3 in. long, 1.25 in. wide. Cymes on branch ends of 5 flowers subtended by 2 small leaves. Calyx cup-shaped hairy, lobes subulate, longer than the tube, appressed hairy, .25 in. long. Corolla glabrous, tube 1 in. long, lobes .4 in. long, ovate, oblong, acute 8.

Kelantan : Kota Bharu. Feb. 1917.

This is allied to *J. syringaefolium*, Wall. of Tenasserim but the flowers are much larger.

60. *Jasminum Evansii*, *sp. nov.*

Climber with slender tomentose branches. Leaves lanceolate acuminate, base round, sparsely dotted with hairs above, midrib sunk, pubescent beneath more thickly hairy, midrib tomentose 2.25 in. long, 1 in. wide ; nerves 4 pairs, petiole .2 in. long, tomentose. Cymes on short lateral branches .5 in. long. Bracts small, linear. Pedicels 1 in. long. Calyx cup-shaped with subulate points as long as tube .12 in. long, pubescent. Corolla glabrous, tube slender .8 in. long ; lobes 8, rather narrow, linear, oblong, acute .35 in. long. Fruit .4 in. long, didymous, ellipsoid.

Pahang : Gunong Senyum (Evans).

Nearest to *J. Horsfieldii*, Miq. of Banka Id. but the leaves thinner, less densely hairy and with more nerves.

61. *Olea penangiana*, *sp. nov.*

Small tree. Young branches pubescent. Leaves entire, coriaceous, lanceolate or oblong lanceolate acuminate, base shortly cuneate ; nerves 8-10 pairs, obscure, midrib prominent 3.5-4.5 in. long, 1-2 in. wide. Cymes in spreading axillary and terminal panicles 6 in. long, umbellate. Bracts leafy, oblong up to 1.5 in. long. Calyx pubescent, lobes 4, round. Corolla campanulate .15 in. long, lobes round.

Penang : Penara Bukit and Telok Bahang (Curtis).

This plant has been referred by King to Wallich's *O. dentata* an Amherst plant with spiny-toothed leaves and much more conspicuous nerves. It is nearer *O. maritima* but the leaves are larger and different in shape and the flowers conspicuously larger.

## GESNERIACEAE.

62. *Boea minutiflora*, *sp. nov.*

Stem rather stout, 4 in. long, densely clothed with long soft, white hairs above. Leaves thin, membranous, ovate or ovate lanceolate, blunt acuminate, base decurrent on petiole, edge coarsely serrate, sparsely hairy with long soft hairs on both sides, densely hairy on nerves beneath and edge 5 in. long, 4 in. wide or less, petiole 1.5 in. long, densely soft, white, hairy. Panicles 2-3 in. wide, very lax on a peduncle 3 in. long, hairy, branches very slender, numerous. Pedicels longer than the flowers. Calyx lobes linear, lanceolate as long as corolla tube. Corolla white .08 in. long,

2 lipped, lower lip longer than recurved upper one, lobes broad, round. Stamens 2 anthers ellipsoid, large. Style longer than corolla. Ovary ovoid. Capsule 15 in. long; acute, spirally twisted.

Pahang : Gunong Senyum (Evans).

This soft, woolly plant has I think, the smallest flowers of any in the Order. It is nearest perhaps to *B. parviflora*, Ridl.

63. *Chirita parvula*, *sp. nov.*

Slender dwarf herb, 6 in. tall, sparsely hairy. Leaves thin membranous, ovate, lanceolate entire, acute base decurrent, shortly hairy all over, 3 in. long, 1.5 in. wide, petiole 1 in. long. Flowers solitary or paired axillary, pedicels hairy 1 in. long. Calyx .4 in. long, lobes narrow, lanceolate acuminate, hairy. Corolla light violet, tube cylindric .5 in. long dilate above limb .4 in. wide unequally bilobed. Capsule very narrow, cylindric acuminate 1.5 in. long.

Pahang : Kota Tongkat, 10th mile Benta-Kuantan road (Evans).

Closely allied to *C. viola*, Ridl., but differing in its hairiness and the long-tubed corolla and the much longer hairy calyx.

SCROPHULARIACEAE.

64. *Torenia bimaculata*, *sp. nov.*

Branched herb 12 in. tall ; stems 4-angled, glabrous except the hairy young parts. Leaves ovate, acute, base decurrent on petiole often oblique serrate, nerves 6 pairs, elevate and almost winged beneath, 1 in. long .5 in. wide ; petiole .25 in. long. Flowers 1-5 in a terminal umbel with narrow linear acuminate bracts .25 in. long ; pedicels .5 in. long. Calyx ellipsoid decurrent on pedicel distinctly winged, lobes acuminate subulate .5 in. long, .25 in. wide, hairy on the edges at tip. Corolla-tube slender, as long as calyx ; limb about .25 in. across, bilabiate pale blue with a dark purple spot on each side of flower lip, mouth of tube yellow inside. Calyx in fruit wider.

Kelantan : Chaning on river banks, Feb. 1917.

A very similar plant to this I found at Angkor Wat in Cambodia, but the leaves in that are rounded at base and the calyx more narrowly winged. I cannot match either with any of Bonati's descriptions in Bull. Soc. France lv. p. 512. *T. bimaculata* in colouring resembles the well-known garden plant *T. Fournieri* of Siam but is much more branched and the flowers are smaller.

ACANTHACEAE.

65. *Leda rubrolutea*, *sp. nov.*

A creeping; ascending slender herb about 6 in. tall, pubescent. Leaves few in distant equal pairs, elliptic



lanceolate or lanceolate acuminate, blunt ; base narrowed, herbaceous, scurfy pubescent beneath, with many small raphides  $\cdot 2$ – $\cdot 3$  in. long,  $\cdot 6$ – $\cdot 1$  in. wide ; petiole slender  $\cdot 2$  in. long. Raceme terminal, 4 in. long of about 10 rather distant sessile solitary or paired flowers. Bracts minute lanceolate. Sepals linear acuminate, glabrous. Corolla  $\cdot 25$  in. long, glabrous, lips equilong, lower broader with short lobes ; upper lobe and tube brown-red with two pale stripes, lower lobe yellow. Stamens 2, filament glabrous. Anther cells ellipsoid, muticous unequally placed. Capsule with long narrow base and top clubbed acute,  $\cdot 5$  in. long containing 2 seeds.

Kelantan : Chaning Woods.

66. *Justicia ovalis*, *sp. nov.*

Herb puberulous with a line of hairs running along the stem, stem 18 in. tall. Leaves in distant pairs ovate acuminate, subcuspidate, blunt, base narrowed ; nerves 6–7 pairs,  $4\cdot 5$ – $5$  in. long,  $2$ – $3$  in. wide, petiole slender  $\cdot 5$  in. long. Raceme terminal, slender, puberulous peduncle 6 in. long. Flowers few. Sepals lanceolate setaceous  $\cdot 1$  in. long. Corolla  $\cdot 3$  in. long puberulous, rather stout. Upper lip short, oblong, blunt, lower with 2 fleshy ridges and veined transversely between, lobes short, oblong, central one ovate. Stamens 2, shorter than corolla. Anther cells not parallel elliptic, one with a short blunt white process at base.

Pulau Tiuman : Joara Bay (Burkill 970).

Burkill refers this to *Leda obovata* and it has a *Leda*-like habit, but the leaves are not succulent as in that species and the anther and lip are those of *Justicia*.

## VERBENACEAE.

67. *Callicarpa furfuracea*, *sp. nov.*

Branches brown, scurfy. Leaves membranous oblong, acuminate, dentate in upper part ; base truncate ; nerves 7 pairs with reticulations conspicuous beneath, above smooth nerves sunk, midrib scurfy, beneath pale, whitish nerves, nervules and reticulations brown scurfy  $5$  in. long,  $2\cdot 75$  in. wide, petiole  $\cdot 5$  in. long. Cymes panicate terminal 1 in. or more long, many flowered, brown scurfy. Pedicels  $\cdot 05$  in. long with calyx and corolla white tomentose. Calyx cup-shaped, entire. Corolla  $\cdot 1$  in. long, regular lobes 4, short ovate, blunt. Stamens 4, filaments from corolla base slender, anthers large oblong just exsert.

Pahang : Gunong Senyum (Evans).

This is of the section of *C. arborea*, but distinguished by its brown fur and leaves white beneath with brown, scurfy reticulations.

*Avicennia*.

The Asiatic *Avicennias* have been very much confused. Indeed in most works, they are reduced to 2 species only,

*A. officinalis*, and *A. alba*. In the field however, it is clear that there are more than these 2 species.

68. *Avicennia officinalis*, L.

Is a common species with obovate round tipped leaves, very nearly glabrous, and *A. alba* has lanceolate pointed leaves which dry black and are white beneath. Griffith described in Notul. iv, p. 189, a distinct plant *A. intermedia* which appears (as Griffith suggests) to be a hybrid between these two species. It has obovate to lanceolate leaves, blunt, pale puberulous beneath. Fruit rather small, cordate ovoid, glaucous. It occurs at Malacca, Pulau Jawa (Griffith). Selangor, Klang (Watson). Dindings, Pangkor (Scortechini).

69. *Avicennia sphaerocarpa*, Stapf (ined).

Is a small tree. Leaves elliptic narrowed to the tip or round, the base narrowed, whitish beneath, 3 in. long, 1·5 in. wide, petiole winged above ·25 in. long. Inflorescence axillary of 2-3 or more flowers, terminal on peduncles ·30-·75 in. long, pubescent. Calyx lobes oblong ciliate, silky ·15 in. long. Corolla I have not seen. Fruit ovoid, round subglobose, not beaked ·75 in. long.

This so far as I know only occurs in the Malay Peninsula in Penang where Curtis collected it at Sungai Penang ; but it also occurs in Siam, the Philippines and China. It is a very distinct plant in the small round not beaked fruit and smaller leaves.

70. *Avicennia lanata*, *sp. nov.*

Is a new and distinct species, to which my attention was called by Mr. J. G. Watson, who has been studying the species of *Avicennia* in the Malay Peninsula and made careful notes of the differences in the species. To a certain extent it has the habit of *A. officinalis*, but branches and leaves beneath are distinctly yellow tomentose. I take the description below mainly from his notes.

A large tree. Leaves obovate blunt closely yellow tomentose beneath, glabrous, shining above, nerves 4 pairs, 3 in. long 1·25 in. wide ; petiole wrinkled, pubescent ·5 in. long. Flowers in cymose heads, in threes in a compound cyme, axillary peduncle ·5-·75 in. long, yellowish, tomentose. Bracts densely tomentose. Calyx-lobes tomentose outside. Corolla glabrous inside, densely hairy outside. Anthers dorsifixed elliptic filaments about the same length. Ovary light green, glabrous but surrounded at the base by dense tomentum. Style bifid, very short, brown, lobes erect. Fruit ovoid not beaked ·5 in. long tomentose.

Singapore : River Valley Road (Burkill and Watson No. 3793, 3797). Pahang, Kuantan : (Watson 2767).

Mr. Watson notes that while Singapore specimens attain a height of 80 ft., trees from the coast of Pahang are small and stunted and there he has never met an example



more than 20 ft. high. The species does not seem to occur in Selangor.

I would add that the cymes are 2-2.5 in. long. The corolla lobes strongly decurved and the whole flower very fragrant. In *A. officinalis* the calyx lobes are spreading but not recurved, the filaments much longer than the anthers and the style long and slender. The flowers have an unpleasant smell.

## LAURACEAE.

### 71. *Litsea glabrifolia*, *sp. nov.*

A glabrous tree. Leaves alternate, thinly coriaceous glaucescent beneath, oblong or oblong-lanceolate, shortly narrowed at the broad base, and blunt at tip, nerves 10 pairs, elevate beneath, 7-8 in. long, 3 in. wide, petiole .5 in. long. Umbellules in short stout racemes, .1 in.-.2 in. long, axillary. Peduncles silky .2 in. long. Involucre of 4 round boat-shaped bracts, silky .15 in. long. Flowers about 7, pedicelled .25 in. long and as wide, silky, lobes linear, oblong as long as the pedicels. Stamens 12, filaments long, slender, hairy, innermost three with oblong stipitate glands. Pistillode cylindric with a 2 or 3-lobed recurved stigma.

Pahang : Gunong Senyum (Evans).

This has somewhat the habit of *L. polyantha* but the leaves are rather thinner and quite glabrous, the umbels much larger and there is a distinct pistillode. I have only seen the male plant.

### 72. *Litsea acrantha*, *sp. nov.*

Branches and petioles shortly rough, setose hairy. Leaves alternate coriaceous, lanceolate acuminate, base narrow, glabrous except the midrib and nerves beneath covered with pale appressed bristles, nerves 7 pairs elevate beneath; nervules horizontal parallel, general surface areolate 3-3.5 in. long, 1.5 in. wide; petiole .25 in. long. Umbels one or more pseudoterminal sessile on a peduncle, silky .25 in. long, .3 in. across when expanded. Involucral bracts 4, ovate, silky, rather thin. Flowers about 4, pedicels silky, lobes 3, ovate round spatulate, 3 inner linear oblong, silky. Stamens 7, filaments slender, glabrous with no glands. Anther oblong 4-celled. Pistillode small conic. Style long but shorter than the perianth with three recurved stigmas.

Kedah-Perak boundary : Gunong Bintang (nat. coll. F.M.S. Mus.).

This has somewhat the appearance of an *Actinodaphne*, but the leaves are not whorled, the stamens in two flowers examined were 7 in number. It is quite unlike any *Litsea* known to me in the falsely terminal flowers.

## ORCHIDEAE.

**73. *Ascochilus capricornis*, *sp. nov.***

Stems tufted, branched 4 in. tall. Leaves rigid terete grooved above recurved, blunt, 1 in. long, sheaths .2 in. long strongly ribbed and cancellate with transverse bars. Racemes 2-2.5 in. long, lax. Bracts ovate sheathing persistent. Pedicels .25 in. long. Flowers .25 in. wide. Sepals oblong, rounded, upper one magenta, laterals falcate, broad brownish green mottled red. Petals oblong, blunt as long as upper sepal. Lip shortly clawed side lobes erect triangular, midlobe porrect much longer triangular lanceolate acuminate, spur scrotiform, an oblong blunt fleshy callus from the back over the mouth of the spur. Column tall, winged above.

Pahang : Gunong Senyum (Evans).

This remarkable species has stiff curved terete leaves like the horn of an Ibex, and for the genus rather large flowers.

**74. *Taeniophyllum culiciferum*, *sp. nov.***

Stem .5 in. long, roots numerous very slender, 9 in. or less. Peduncle filiform 1 in. long, raceme .12-.15 in. long, bracts distichous, very small about 15. Pedicel filiform .15 in. long. Flowers .12 in. long, pale yellow. Sepals and petals sub-similar, lanceolate linear acuminate acute, lip lanceolate acuminate nearly as long and broader, spur flask-shaped, narrowed at base, then ellipsoid, blunt nearly as long as the pedicel. Fruit cylindric .5 in. long.

Pahang : Rumpin river mouth (Evans). Kelantan : Chaning Woods (Ridley).

Resembling *T. macrorrhizum*, Ridl. in habit, but with very much smaller flowers with narrow petals, sepals and lip.

## ZINGIBERACEAE.

**75. *Amomum xanthoglossum*, *sp. nov.***

Stem tall, rather slender, glabrous. Leaves oblong, lanceolate, cuspidate, narrowed to base, glabrous 15 in. long, 3 in. wide, petiole slender .5 in. long ; ligule shorter round at tip entire. Spike obconic shortly peduncled, 3 in. long, glabrous. Bracts smooth, chartaceous oblong, tip round, upper ones with a short mucro, lower ones 1 in. long .6 in. wide. Calyx tubular, truncate, glabrous .5 in. long. Corolla tube cylindric silky hairy 1 in. long, lobes oblong white. Lip broad obovate, clawed, 1 in. wide, edge entire yellow inside, veined red at base. Stamens 1 in. long, no crest, but arms elongate, curved, .2 in. long, linear.

Kelantan : Chaning Woods.

**76. *Amomum aurantiacum*, *sp. nov.***

Stem stout, tall, glabrous. Leaves oblong acuminate shortly narrowed at base, subcoriaceous 13 in. long, 3 in.



wide, petiole short and thick, ligule oblong truncate, longer. Spike ovoid, 1.5 in. long, peduncle stout 2 in. long covered with ovate blunt rounded pubescent bracts finely ribbed, ciliate on edge, uppermost .75 in. long .5 in. wide. Flowers large, orange, lip centre red. Calyx spathaceous glabrous except pubescent tips of lobes bilobed lobes ovate, 1 in. long. Corolla tube as long, lobes linear oblong, rounded 1.25 in. long. Lip obovate broad, rounded 1 in. long and nearly as broad. Stamen shorter, with a short rounded crest and two broad, oblong curved truncate arms, 8-nerved. Style hairy.

Kelantan : Glam Wood at Kota Bahru.

77. *Amomum cephalotes*, *sp. nov.*

Stems slender, glabrous. Leaves narrow, linear long acuminate narrowed to base, glabrous, 12 in. long .8 in. wide ; petiole hardly any, ligule .25 in. oblong entire. Capitula subglobose 1.5 long, on a peduncle 5 in. long, covered with lanceolate bracts, glabrous .1 in. or less, finally breaking up into fibres. Outer bracts lanceolate pubescent, pale ribbed 1 in. long. Flowers pedicelled with a rather stout, velvety pedicel .25 in. long. Calyx spathaceous with 3 acute hairy points. Corolla tube .1 in. long lobes linear oblong, blunt .5 in. long glabrous lip obovate as long and about .3 in. wide, with 2 central keels. Stamen filament very short, anther broad oblong, top retuse, no crest, pubescent.

Pahang : Gunong Senyum (Evans).

Flowers cream with yellow midrib and tips slightly streaked with brown.

78. *Alpinia pahangensis*, *sp. nov.*

Stem moderately stout. Leaves linear oblong with a setaceous point .6 in. long, base acuminate, softly hairy on both sides 2 ft. long, 3.5 in. wide, petiole .5 in. long ; ligule ovate blunt hairy .3 in. long, sheath finely ribbed, hairy. Racemes stout 8 in. long, velvety hairy. Bracts at base 2, lanceolate acuminate with a long setaceous point, pale papery pubescent, edge at tip hairy, the lowest 4.25 in. long, 1 in. wide. Flowers numerous, distant, pedicels densely velvety hairy .2 in. long. Bracts (floral) sheathing flowers .5 in. long, pale, hairy at base and on edge at tip. Calyx spathaceous tubular glabrous .4 in. long, truncate or obscurely 3-lobed, cleft on one side. Corolla tube as long, lobes linear lanceolate, hairy acute .6 in. long. Lip 1 in. long, 3 lobed apparently red, side lobes broad truncate, midlobe longer, oblong entire, 2 short ears at base, all glabrous. Stamen .75 in. long, no crest, ovary silky.

Pahang : Pekan (Evans).

Allied to *A. bracteata*, Roxb., but the flowers are smaller, and the calyx is not campanulate and deeply cleft on one side but cylindric.

## LILIACEAE.

79. *Peliosanthes monticola*, *sp. nov.*

A small plant with apparently a rather long woody rhizome silvery, papery sheaths at the base. Leaves lanceolate acuminate at both ends 5 in. long, 1.5 in. wide, nerves 7. Raceme 2 in. long on a 1 in. peduncle. Bracts at base broad lanceolate .25 in. long, .1 in. wide, upper ones narrow lanceolate linear. Flowers solitary in bracts. Perianth .3 in. wide, lobes oblong, blunt at tip. Stamens forming a complete ring free from the perianth nearly to base. Ovary free from stamen-ring, superior, style thick, cylindric.

Perak : Gunong Kerbau 5,000 ft. (nat. coll. F.M.S. Mus.).

This is perhaps most nearly allied to *P. lurida* but is altogether smaller. The lower peduncular bracts are remarkably broad, and the perianth is free from the stamens and ovary and so is inferior.

80. *Dracaena cuspidata*, *sp. nov.*

Dwarf plant. Stems stout. Leaves oblong abruptly cuspidate with setaceous tip, base narrowed to sheath, 9 in. long 2.25 in. wide, cusp .5 in., sheath broad 1 in. long. Panicle racemiform, fairly stout 5 in. long, flowers in threes, pedicels .1 in. Perianth very slender 1 in. long, clubbed when in bud lobes very narrow, linear free two-third of length, filaments longer ; anthers short, oblong.

Kelantan : Chaning Woods (Ridley).

## ERIOCAULACEAE.

81. *Eriocaulon disepalum*, *sp. nov.*

Dwarf plant 4-6 in. tall. Leaves linear acuminate 2.5 in. long .15 in. wide. Scapes 5 in. slender numerous ribbed heads .2 in. wide, glabrous. Involucral bracts white spathulate round with a few minute teeth at tip, shorter than head. Floral bracts spathulate with broader round top, slightly fuscous. Male flowers ; sepals 2, short spathulate. Corolla tube longer, lobes minute. Anthers black, 6. Female flowers sepals 3, linear, narrow, petals none, ovary yellow trilobed, style long, slender, stigmas 2, seed yellow, ellipsoid vertically ribbed.

Kelantan : Ricefields at Tumput, Kota Bahru.

Allied to *E. Sieboldianum*, Sieb. but differing in the free sepals, very short corolla lobes in the male flower and broader leaves.

82. *Eriocaulon glabriflorum*, *sp. nov.*

Dwarf plant with the habit of *E. truncatum* but leaves and stems narrower. Leaves narrow, linear acuminate .5-1 in. long .05-.1 in. wide. Scapes very slender 3-4 in. tall. Heads semiorbicular .1 in. wide, white glabrous. Involucral bracts oblong subobtuse shorter than the head. Inner bracts spathulate, yellowish white tipped fuscous.



Male flowers, sepals 2, spathulate acute, glabrous, narrow-tipped fuscous, longer than the corolla tube, lobes 3, short, equal. Female flowers, sepals 2, linear, spathulate. Petals 3, similar. Pistil yellowish, styles little shorter than the sepals.

Damp sand and on rocks.

Langkawi Ids : Burau, Telaga Tujoh (Ridley 15671 and 8144) ; Burau (Robinson 6239). Terutau Id : Telok Wau (Robinson). Singgora (Annandale).

This little plant belongs to the same set as *E. truncatum*, Ham., but is always much more slender with narrower leaves and smaller heads. It differs also in its perfectly glabrous perianth of which the segments also are much narrower.

#### GRAMINEAE.

##### 83. *Dimeria glabra*, *sp. nov.*

Tufted grass quite glabrous. Leaves narrow linear acuminate 4 in. long .05 in. wide, ligule very short. Culms slender 8-12 in. tall. Spikes 2-3, slender 2.5 in. long, at first red then paler, rachis minutely scabrid flexuous. Callus glabrous. Spikelets sessile .1 in. long, glabrous. Glume I. narrow linear, II. oblong keeled, keel red edge broad translucent, white, III. shorter, oblong, Awn none.

Singapore : Holland Road, edge of a swampy hollow (Burkill 4674).

Allied to *D. alata*, Hook. fil. of Ceylon and much resembling it, but completely glabrous, and the rachis flatter and more flexuous.

#### FILICES.

##### 84. *Lastroea* (*Dryopteris*) *Robinsonii*, *sp. nov.*

Stem erect 1.5 in. tall with long roots. Stepes tufted the bases covered with linear acuminate chestnut colored scales, above nerde glender dark purple and brown scurfy. Fronds lanceolate 6-7 in. long pinnate ; pinnae linear-oblong 1.5 in. long .2 in. wide coriaceous, lower ones shorter deflexed, more than 40, rachis densely brown-tomentose, rachilla and midribs above densely hairy beneath scurfy, pinnae cut into ovate lanceolate blunt lobes nearly to the rachilla about 20, nerves few pinnate. Sori 1 to 4 on a lobe on the tips of the nerves near the edge, round. Indusium reniform glabrous.

Perak : Gunong Kerbau at 4,200 ft. (nat. coll. F.M.S. Mus.).

This elegant little fern is allied to *L. calcarata* and especially to the form *ciliata* but differs in the indumentum, the shortly cut lobes and the distinctly coriaceous texture of the pinnae. The whole frond is much more narrow than in any form of *L. calcarata*.

## V. NOTES ON MALAYSIAN BUTTERFLIES (PART I).

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Since the publication in 1882-86 of Distant's fine work, "*Rhopalocera Malayana*," very little has been published on the Butterflies of the Malay Peninsula. Neighbouring Malayan countries have received a certain amount of attention; thus de Nicéville listed the Butterflies of Sumatra in 1895; Piepers, Snellen and Fruhstorfer have recently brought out four volumes on the *Rhopalocera* of Java; Shelford (1901-06) and the present writer (1911-15) have dealt with most of the Butterflies of Borneo. Godfrey (1916) has listed those of Siam, which includes a small portion of the true Malaysian subregion.

During the last ten years an important contribution to the literature on Eastern *Rhopalocera* has been brought out by Dr. Adalbert Seitz in his great work "*The Macrolepidoptera of the World*," of which Vol. IX is devoted to the *Rhopalocera* of the Indo-Australian region. Up to the present the *Papilionidae* and *Nymphalidae* have been completed; the *Lycaenidae* are being dealt with; but the parts on the *Hesperiidae* have yet to appear. There is an English edition of this work; the very numerous and wholly admirable plates add considerably to its value. It is also up-to-date in its adoption of the trinomial system of nomenclature.

Until a new edition of Distant's "*Rhopalocera Malayana*" is published, Seitz's "*Macrolepidoptera of the World*" must be regarded as indispensable to any student of Malaysian Butterflies, with whom in any case both works will long remain in use. I have on this account given references under each species to these two works; all other references have been relegated to foot-notes.

It is thought, therefore, that any notes which will supplement or correct the information given in Seitz's "*Macrolepidoptera of the World*" are perhaps worth publication from time to time as they accumulate. The following notes are chiefly based on the collections in the Federated Malay States Museums, part of which I have had the privilege of examining and identifying recently. Although as I understand it, no exclusive attention has hitherto been paid by the F.M.S. Museums to the formation of any extensive collection of Malaysian butterflies, the collections so far submitted to me prove of no little interest.

The Director of Agriculture, Kuala Lumpur, forwarded a collection of Malay Peninsula *Danaines* for identification. Additional localities from this collection have been incorporated in these notes.



The Director of the Zoological Museum, Buitenzorg, has been kind enough to send me for identification a small, but interesting, collection of Danaines from Java and neighbouring islands. Two new subspecies from the islands of Krakatau and Verlaten are described from this material.

My thanks are also due to the Acting Curator of the Sarawak Museum for the loan of Bornean specimens from that Museum and to Mr. E. J. Godfrey for Siamese specimens for comparison. The collections in the Raffles Museum, Singapore, have also provided material for additional notes.

The "Malaysian" butterflies considered in these and subsequent notes are confined to a "true Malaysian" sub-region<sup>1</sup> which, for Museum purposes, I regard as those countries lying between Lat. 10° N. and 10° S. and Long. 95° and 120° E., i.e., the Malay Peninsula, Borneo, Sumatra and Java and adjacent islands. An exception is made in the case of a few butterflies from S.W. Siam (Tasan, Lat. 10° 30' N., and Hat Sanuk, Lat. 12° N.), which are included in the F.M.S. Museums collection. They are of interest in that some species are inseparable from Malayan forms, while others obviously belong to the Siamese-Tenasserim fauna.

The following new forms and new combinations are introduced in this paper :—

- 8a. *Danaida juvena* Cr. *krakatauæ* subsp. nov.
- 23. *Danaida plexippus* L. *plexippus* L. *connectens* f. nov.
- 24a. *Danaida melanippus* Cr. *insularis* subsp. nov.
- 27a. *Euploea crameri* Lac. *snelleni* subsp. nov.
- 34. *Euploea core* Cr. *distanti* Moore, comb. nov.
- 37a. *Euploea alcathoe* Godt. *monticola* subsp. nov.
- 40. *Euploea dufresne* Godt. *harrisi* Feld. comb. nov.
- 40. *Euploea dufresne* Godt. *mithrenes* Fruhst. comb. nov.
- 40. *Euploea dufresne* Godt. *convallaria* Thieme, comb. nov.
- 40. *Euploea dufresne* Godt. *nica* Fruhst. comb. nov.
- 40. *Euploea dufresne* Godt. *tyrianthina* Moore, comb. nov.
- 40. *Euploea dufresne* Godt. *lacordairei* Moore, comb. nov.
- 40. *Euploea dufresne* Godt. *baueanica* Fruhst., comb. nov.

<sup>1</sup>A true Malaysian subregion, as opposed to a wider area in which a non-Malaysian element is evident although not necessarily predominant, e.g. an area including Celebes, Palawan and Siam, to all of which countries many "true" Malaysian species extend.

The boundaries for this true Malaysian subregion must necessarily be arbitrary to some extent. For Museum purposes I have extended the northern boundary to Lat. 10° N., although, as Mr. Boden Kloss points out, the fauna of the Malay Peninsula between 7° and 10° N. is as much Indo-Chinese in character as Malayan.

BODEN KLOSS, 1918, p. 245, writes: "Malaysian—Pertaining to the Malay Peninsula, Sumatra, Borneo and Java. Malayan—Pertaining to the Malay Peninsula, Cf. Sumatran, etc." See also BODEN KLOSS, 1920, pp. 79, 80.

The nomenclature adopted is that used in Seitz's "Macrolepidoptera of the World," unless otherwise stated. The method of printing the subspecific name in less prominent type than the generic and specific names was adopted in my "Hand List of the Birds of Borneo"<sup>1</sup> and my paper on the "The Butterflies of Borneo."<sup>2</sup> The retention of the author's name for a species even when followed by a subspecific name was also adopted in those papers. Both courses appear to me to be an improvement on the usually accepted method of writing trinomials, and have since received the official approval of the British Association Committee on Zoological Nomenclature.

All the species of *Danainae* now known from Malaysia are listed in this paper and numbered consecutively from 1 to 52. Under each species all the Malaysian subspecies are listed but not numbered.

A list of the literature quoted is placed at the end of this paper. The footnotes refer thereto.

### Fam. NYMPHALIDAE.

#### Subfam. DANAINAE.

#### Genus HESTIA, Hübn.

The four Malaysian species of this genus fall into two groups or subgenera :—

- a. Wings elongate and weak ; hind wing with three irregular dark spots (the outer one small) in space between costal nervure and first subcostal nervule *Hestia.*
- a'. Wings rounded and stronger ; hind wing with only two irregular spots in costal interspace *Nectaria.*

The structural differences between these two "groups" as given by Fruhstorfer<sup>3</sup> do not appear to be sufficiently marked or constant to be of much assistance. The second subcostal nervule of the fore wing arises as a rule very slightly nearer to the apex of the cell in *Hestia* males than in *Nectaria*, but in *Hestia* females there are some in which the origin of this nervule is just as far from the apex of the cell as in the *Nectaria* species. The second character given by Fruhstorfer, viz. length of lower discocellular in the hind wing, is also variable and not markedly distinct in the two subgenera. The superficial characters given in the above key, however, will serve to distinguish the two subgenera<sup>4</sup> quite clearly.

<sup>1</sup> MOULTON, 1914, pp. 127-8, 131 *et seq.*

<sup>2</sup> MOULTON, 1915, pp. 198, 200 *et seq.*

<sup>3</sup> FRUHSTORFER, 1910, p. 218.

<sup>4</sup> I follow Bingham in using the term "subgenus" for subdivisions of a genus, rather than de Nicéville who used the term "group." Fruhstorfer uses both terms, the latter ranking as of less importance than the former. The distinction between differences of "subgeneric" and differences of "group" importance must necessarily be a matter of personal opinion, probably productive of more confusion and discord than clearness. In this paper, therefore, genera, when divided at all, are split into subgenera only.



Subgenus *HESTIA*, Hübn.1. *Hestia lynceus* Drury *reinwardti* Moore.*Hestia lynceus reinwardti* Fruhstorfer 1910, p. 220.*Hestia lynceus* Distant 1882—86, pp. 6 and 405, Tab. I, fig. 2.

*Loc.* Perak : Kampar ; Selangor : Ulu Langat, Bukit Kutu and Ayer Itam ; Negri Sembilan : Bukit Tangga ; Pahang : Kuala Tahan ; Tioman Island (F.M.S. Mus.). Selangor : Klang (F.M.S. Agric. Dept.). Perak ; Selangor ; Negri Sembilan : Gunong Angsi ; Singapore (Raffles Mus.).

*Distrib.* Confined to Malaysia, where the following subspecies are recognized :—

<i>H. l. lynceus</i> Drury	Sumatra.
<i>H. l. reinwardti</i> Moore	Malay Peninsula.
<i>H. l. niasica</i> Fruhst.	Nias I.
<i>H. l. fumata</i> Fruhst.	Borneo.
<i>H. l. stolli</i> Moore	Java.
<i>H. l. thalassica</i> Fruhst.	Natuna Is.

2. *Hestia logani* Moore *logani* Moore.*Hestia logani logani* Fruhstorfer 1910, p. 220.*Hestia logani* as a synonym of *Hestia lynceus* Distant 1886, p. 405.

*Loc.* Perak : Gunong Kledang, alt. 2646 ft., November 1916 (Raffles Mus.).

*Distrib.* Confined to Malaysia<sup>1</sup>, with the following subspecies distinguished :—

<i>H. l. logani</i> Moore	Malay Peninsula.
<i>H. l. druryi</i> Moore	Sumatra.
<i>H. l. donovani</i> Moore	Singapore.
<i>H. l. diana</i> Fruhst.	Batu Is.
<i>H. l. virgo</i> Fruhst.	Borneo.
<i>H. l. alceste</i> Fruhst.	Natuna Is.
<i>H. l. mevaria</i> Fruhst.	Java.

Fruhstorfer distinguishes these two species thus : *lynceus*, noticeable for the dense blackish dusting on the upper side of both wings, while in *logani* the ground-colour is lighter and the blackish dusting on the upper side is reduced. Admittedly these *Hestias* are very variable ; so much so that other writers have regarded *lynceus* and *logani* as but one variable species. Breeding experiments will alone decide the point, although Fruhstorfer regards certain differences in the genitalia as "of such decisive significance that the specific rank of *logani* cannot be questioned" (*l.c.*). Piepers<sup>2</sup> doubts the value of these differences in genitalia.

<sup>1</sup> Fruhstorfer recognizes another subspecies, *H. l. hypata* Fruhst. from the Sulu Islands to the North of Borneo, *i.e.*, just outside the limits of the Malaysian subregion.

<sup>2</sup> PIEPERS, 1913, p. 21, writes : "Dr. Henri de Graaf, a specialist in this kind of researches, has investigated microscopically 25 specimens from my collection, both light and dark coloured, and he did not find a single one amongst them whose genitalia agreed with the figure given of those of *stolli*, on the contrary they all agreed with those given of *logani*, and although considerable individual differences were observed in this respect it was only as regards the form of the valvae and valvulae and not to such an extent in connection with the structure of the principal organs that the existence of more than one species could be inferred from it."

Of the Malay Peninsula specimens examined, all appear referable to *lynceus* with the exception of one male in the Raffles Museum which I have placed with some doubt under *logani*.

Subgenus *NECTARIA*, Dalm.

- a. Hind-marginal row of alternately large and small black spots on both wings *linteata*.  
 a'. Hind-marginal black border enclosing hind-marginal row of white spots *chersonesia*.

3. *Hestia hypermnestra* Westw. *linteata* Butl.

*Hestia lynceus retnwardti* Fruhstorfer 1910, p. 220.

*Hestia lynceus* Distant 1882—86, pp. 6 and 405, Tab. I, fig. 2.

*Hestia hypermnestra linteata* Fruhstorfer 1910, p. 221.

*Hestia linteata* Distant 1882, p. 7, Tab. I, fig. 1.

*Loc.* Negri Sembilan: Bukit Tangga (F.M.S. Mus.).  
 Pahang: Kuala Krau (F.M.S. Agric. Dept.). Negri Sembilan: Jelebu (Raffles Mus.).

*Distrib.* Confined to Malaysia except for a slight extension northward above Lat. 10° N. into South Tenasserim.

- H. h. hypermnestra* Westw. Borneo and Natuna Is.  
*H. h. arbela* Fruhst. North Borneo (Mt. Kinabalu).  
*H. h. hera* Fruhst. Sumatra.  
*H. h. linteata* Butl. Malay Peninsula.  
*H. h. belia* Westw. Java (West).<sup>1</sup>

Evidently a rare species. The F.M.S. Museums specimen agrees very well with Distant's figure in "Rhopalocera Malayana."

4. *Hestia leuconoe* Eschsch. *chersonesia* Fruhst.

*Hestia leuconoe chersonesia* Fruhstorfer 1910, p. 222.

*Hestia leuconoe nigriana* Fruhstorfer 1910, p. 222.

*Hestia leuconoe natunensis* Fruhstorfer 1910, p. 222.

*Hestia leuconoe javana* Fruhstorfer 1910, p. 222.

*Hestia leuconoe* Distant 1886, p. 406, Tab. XXXIX, fig. 3.

*Loc.* Negri Sembilan: Jelebu; Johore, Jalan Dato; Singapore (Raffles Mus.). Singapore (Distant).

*Distrib.* Loo Choo Islands, Formosa and Philippines to Malaysia.

- H. l. chersonesia* Fruhst. Malay Peninsula to Borneo, Java and Natuna Is.  
*H. l. vedana* Fruhst. Batu Is.  
*H. l. enganoensis* Doh. Engano I.

Although Fruhstorfer gives the "Malay Peninsula" as part of the distribution of *chersonesia*, I suspect that it is confined to the southern half of the Peninsula: perhaps not occurring north of Negri Sembilan. Godfrey<sup>2</sup> describes a very distinct subspecies *siamensis* from Nong Khor and Hup Bon in Siam (Lat. 13° N.). Probably the original continental range of *leuconoe* has long been interrupted and the species has died out for some reason or other in the north of the Malay Peninsula leaving a gap between the range of (and at the same time giving rise to) the present-day subspecies *siamensis* and *chersonesia*.

<sup>1</sup> FRUHSTORFER (1910) describes another subspecies *vollenhoveni* "with the somewhat uncertain locality 'Java,' known from a figure of Snellen van Vollenhoven's." PIERERS (1913) does not mention it.  
<sup>2</sup> GODFREY, 1916, p. 117.



It has been shewn<sup>1</sup> that the subspecies *nigriana*, *chersonesia* and *natunensis*, recognized by Fruhstorfer, are not separable. Piepers<sup>2</sup> states that *javana* is referable to *natunensis*. I therefore use Fruhstorfer's name *chersonesia* to cover all these forms from the Malay Peninsula, Lingga Archipelago, Banka, Borneo, Natuna Islands, Java and the Kangean Islands (East of Java).

It is evidently a variable species, but unfortunately rare in collections. Godfrey's *siamensis* is remarkable for the absence of a spot immediately below the cell in the fore wing between the first and second median nervules, which is always present in *chersonesia*. The double cell-spot in the hind wing of *siamensis* is very much smaller than that of *chersonesia*.

#### Genus IDEOPSIS, Horsf.

The only species of this genus found in the Malay Peninsula is common and well-distributed. The general pattern of large black spots and blackened veins on vitreous smoky-white ground-colour makes it easily recognizable, although if it were not for its smaller and stronger wings, it might be taken for a *Hestia*.

*Ideopsis* has been, until recently, regarded as an intermediate between *Hestia* and *Danaida*. Fruhstorfer, however, compares it to the *Radena*-group of *Danaida*, and suggests that the larva and pupa, when discovered, will resemble those of *Radena* rather than those of *Hestia*. It is remarkable that the life-history of so common a species should still remain unknown.

#### 5. *Ideopsis daos* Boisd. *perakana* Fruhst.

*Ideopsis daos perakana* Fruhstorfer 1910, p. 216, fig. 76a.

*Ideopsis daos* Distant 1882-86, pp. 8 & 97, Tab. I, figs. 3 & 4.

An examination of some 200 specimens from the F.M.S. Museums, the F.M.S. Agricultural Department and the Raffles Museum, Singapore, shows that this species is widely distributed throughout the Malay Peninsula, ranging from low country to 3,000 ft. and probably higher.

Probably on the wing all the year round, as specimens in the above collections have been caught in every month of the year except January, February and October.

The species is variable in the size of the wing and in the size of the black spots. Males and females are equally abundant.

A single female in the F.M.S. Museums from Tioman Island (off the East Coast of Pahang and Johore) differs from the mainland form in the much shorter fore wing

<sup>1</sup> Moulton, 1915, p. 201.

<sup>2</sup> Piepers, 1913, p. 22.

and more smoky colouring above and below ; in this last respect it approaches mainland males. Further examples are wanted from this island before the question of possible subspecific distinction for this form can be settled.

*Distrib.* Neomalaya and Palawan. The Malaysian subspecies are :—

<i>I. d. daos</i> Boisd.	Borneo.
<i>I. d. perakana</i> Fruhst.	Mentawai Is.
<i>I. d. natunensis</i> Fruhst.	Malay Peninsula.
<i>I. d. lingana</i> Fruhst.	Lingga Archipelago.
<i>I. d. sonia</i> Fruhst.	Natuna Is.
<i>I. d. eudora</i> Gray	North Sumatra.
<i>I. d. costalis</i> Moore	West Sumatra.
<i>I. d. batuna</i> Fruhst.	Nias I.
<i>I. d. nigrocostalis</i> Hag.	Batu Is.

One other very distinct form occurs in Malaysia :—

#### 6. *Ideopsis gaura* Horsf.

*Ideopsis gaura* Fruhstorfer 1910, p. 216.

*Distrib.* Java.

It is perhaps doubtful policy to give it specific distinction, as it is obviously the Javan representative of *daos*. Unfortunately *gaura* is the older name, so that if we are to recognize but one species in Malaysia, it will bear that name, while Boisdual's long-accepted name *daos* will only cover the Bornean subspecies.

On the other hand the separation of the Javan form as a separate species serves a good purpose in emphasizing the marked difference between the fauna of Java and that of the three neighbouring countries (Malay Peninsula, Borneo and Sumatra) which I have designated Neomalaya.<sup>1</sup>

#### Genus *DANAIDA*, Latr.

The species found in the Malay Peninsula fall into the following subgenera :—

- a. Males without scent patch on hind wing *Radena*.
- a'. Males with scent patch on hind wing.
  - b. Two patches at anal angle, on first median nervule and sub-median nervure.
    - c. Sub-median nervure noticeably dilated below *Chittira*.
    - c'. Sub-median nervure not noticeably dilated.
      - d. Base of hind wing not yellow *Parantica*.
      - d'. Base of hind wing canary yellow *Ravadeba*.
  - b'. One patch only, on under side between first median nervule and sub-median nervure.
    - c. Patch protruding as a prominent flap *Tirumala*.
    - c'. Patch smaller and less prominent.
      - d. Patch touching vein *Anosia*.
      - d'. Patch not touching vein.
        - e. Middle discocellular of hind wing strongly angled in male *Limnas*.
        - e'. Middle discocellular slightly incurved in male *Danaida*.

<sup>1</sup> MOULTON, 1915, p. 198.



## Subgenus RADENA, Moore.

- a.* Discal region of hind wing predominantly fuscous, marked with hyaline streaks *vulgaris*.  
*a'*. Discal region of hind wing predominantly pale green hyaline, marked with fuscous lines *sitah*.

7. *Danaida similis* Linn. *vulgaris* Butl.

*Danaida similis vulgaris* Fruhstorfer 1910, p. 211.

*Danaida similis interposita* Fruhstorfer 1910, p. 211.

*Danaida similis macrina* Fruhstorfer 1910, p. 211.

*Radena vulgaris* Distant 1882, p. 10, Tab. I, fig. 8.

A common butterfly ranging throughout the Malay Peninsula from Hat Sanuk, S.W. Siam (Lat. 12° N.), south to Singapore, Borneo and Sumatra.

Two of the three specimens in the F.M.S. Museums series from S.W. Siam are certainly not separable from *vulgaris*. The third is referable to the Siamese subspecies *persimilis* Moore, wet-season form. Large examples of this are regarded by Fruhstorfer as an aberration named *aventina* Cramer, which is characterized by the post-cellular spots of the fore wing being rounded instead of acutely wedge-shaped. The Siamese *persimilis* is similarly distinguished from *vulgaris*, but it is a smaller insect than the *aventina* figured by Fruhstorfer.<sup>1</sup> In the dry-season form the post-cellular spots are reduced in both wings. A specimen from Trengganu in the F.M.S. Museums is an interesting intermediate between wet-season *persimilis* and *aventina*. The hyaline areas are rather larger and more noticeably pale green than in typical *vulgaris*. In size it is larger than *persimilis*, but not quite so large as *aventina*. The application of this latter name to the wet-season form of both *persimilis* and *vulgaris* is, I think, permissible, although the dry-season forms of both are readily separated. Fruhstorfer records a large wet-season form *hyria* in Annam and Tonkin, differing from *aventina* in having the hyaline areas whitish instead of green. The wet-season form *aventina* thus ranges southwards through Siam and is known at present from Hat Sanuk (Lat. 12° N.), Tasan (Lat. 10° 30' N.) and Trengganu (Lat. 5° 30' N.).

Fruhstorfer's subspecies *interposita*<sup>2</sup> for the Bornean forms and *macrina*<sup>3</sup> for the Sumatran forms have already been sunk as synonyms of *vulgaris*. The remaining Malaysian forms are listed below.

*Distrib.* Loo Choo Islands to Palawan, Sumbawa and Flores, and west through South China and Malaysia to India and Ceylon.

*D. s. vulgaris* Butl.

Malay Peninsula, Borneo,  
Natuna Is. and Sumatra.

*D. s. vulgaroides* Fruhst.

Java.

*D. s. megaroides* Fruhst.

Nias I.

*D. s. macra* Doh.

Engano I.

*D. s. ditiones* Fruhst.

Batu Is.

<sup>1</sup> FRUHSTORFER, 1910, fig. 78 C.

<sup>2</sup> MOULTON, 1915, p. 201.

<sup>3</sup> ROTHSCHILD, 1920, p. 148.

The Javan form *vulgaroides* is very doubtfully separable. Those submitted to me by the Buitenzorg Museum differ from Malay Peninsula forms in having the hyaline cell streak slightly reduced. In this point, however, they agree well with Bornean specimens.

8. *Danaida juvena* Cr. *sitah* Fruhst.

*Danaida juvena sitah* Fruhstorfer 1910, p. 213.

*Radena juvena* Distant 1886, p. 407, Tab. XXXIX, fig. 4.

*Loc.* Trengganu 5 ♂♂; Pahang and Johore: Rumpin and Endau 4 ♂♂, 1 ♀; Tioman Island 2 ♂♂, 1 ♀ (F.M.S. Mus.). Anamba Islands: Pulo Siantan 1 ♂, 1 ♀; Pulo Aor 2 ♀♀; Tioman Island 1 ♂ (Raffles Mus.).

*Distrib.* Malay Peninsula and Archipelago to New Guinea and the Solomon Islands. The subspecies recognized in the Malaysian subregion are:—

<i>D. j. juvena</i> Cr.	Java and Bali.
<i>D. j. mincia</i> Fruhst.	Bawean I.
<i>D. j. longa</i> Doh.	Engano I.
<i>D. j. krakatauae</i> Moulton	Krakatau I. and Verlaten I.
<i>D. j. robinsoni</i> Roths.	Sumatra.
<i>D. j. sitah</i> Fruhst.	Anamba Is., Natuna Is. and Malay Peninsula.
<i>D. j. kinitis</i> Fruhst.	North Borneo.

The above record from Trengganu (Lat. 6° N.) represents the northern limit to the range of this species. It is not recorded from Siam.

Fruhstorfer suggests that reports of the occurrence of *juvena* in Malacca and Perak are possibly due to recent migration, as the species is typically insular. The occurrence of specimens on the east coast of the Peninsula in no way differing from Tioman Island or examples from the Anamba Islands tends to confirm Fruhstorfer's theory. Distant (*l.c.*) recorded one from Singapore. The example figured by him is perhaps referable to this subspecies, although the underside is brown rather than black.

Fruhstorfer noticed its absence from Sumatra, but Rothschild<sup>1</sup> has now described a new subspecies, *D. j. robinsoni*, from the west coast of Sumatra. Another new subspecies, *D. j. krakatauae*, from the small islands of Krakatau and Verlaten, between Sumatra and Java, is described below.

A single male in the Raffles Museum labelled "Johore" appears to be typical *juvena* and possibly comes from Java. It differs from the above-mentioned examples of *sitah* in the yellower shade of ground-colour, *i.e.* lacking the pale green tint of *sitah*, in the dark colouring beneath being brown rather than blackish-brown as in *sitah*, in the marginal spots above being smaller and the veins less heavily marked with brown-fuscous.

<sup>1</sup> ROTHSCHILD, 1920, p. 148.



8a. *Danaida juvena* Cr. *krakatauae* subsp. nov.

Differs from *juvena* from Java in the much heavier black fuscous markings and larger size. In this respect it is similar to *sitah* from the Anambas and Malay Peninsula. Differs from *sitah* in having the fore wing slightly narrower and more pointed, the two large greenish-white spots between the median nervules broader and less elongate; the white spots forming the double submarginal row in both wings smaller and more similar to those in *juvena*. Underside fuscous black, lacking the brownish tinge visible in *sitah*. The Engano form *longa*<sup>1</sup> has the discal spots beyond the cell in the fore wing more elongate. The West Sumatran form, *robinsoni*, is stated to be intermediate between *longa* and *phana* from Lombok, and to differ from *longa* in having all the pale markings on both wings whiter and larger.

*Exp. al.* 72–75 mm.

*Type* ♂ : Krakatau Island, December, 1919. *Co-Type* ♂ : Verlaten Island (near Krakatau), December, 1919. Both in the Buitenzorg Museum, Java.

Subgenus CHITTIRA, Moore.

- a. Hind-margin of both wings broadly black-brown fuscous. *plataniston*.
- a<sup>2</sup>. Hind wing broadly margined with red-brown in contrast to dark fuscous hind-marginal colouring of fore wing. *ethologa*.

9. *Danaida melaneus* Cr. *plataniston* Fruhst.

*Danaida melaneus plataniston* Fruhstorfer 1910, p. 210.

*Danatda melaneus sinopion* Fruhstorfer 1910, p. 210.

*Danais melaneus* Distant 1882–86, pp. 14 & 408, Tab. I, fig. 6.

*Loc.* S. W. Siam : Hat Sanuk and Tasan, 36 ♂ ♂ ; Perak : Maxwell's Hill 33 ♂ ♂ , 1 ♀ , Kuala Kangsar, Batang Padang ; Selangor : Bukit Kutu, Ulu Langat, Ginting Bidai, 2,200 ft. (F.M.S. Mus.). Perak : Gunong Kledang, 2,646 ft. ; Selangor-Pahang : Semangko Pass, 2,700 ft. ; Selangor : Bukit Kutu, 3,457 ft. ; Negri Sembilan : Gunceng Angsi 2,000–2,700 ft., Bukit Lantai, 2,400 ft. (Raffles Mus.).

March to August and in November ; probably on the wing all the year round.

Fruhstorfer describes the "very rare race of the Malay Peninsula" as *sinopion* (*l.c.*). His description fits Distant's figure (*l.c.*) of this species, but neither the figure nor the description agrees with a long series from the Malay Peninsula examined by me. The localities given above are taken from a series of 84 specimens from the F.M.S. Museums and 20 from the Raffles Museum. I have since examined others from Pahang, Kuala Lipis, and Negri Sembilan, Bukit Tangga (F.M.S. Mus.), and from Selangor, Ginting Simpah and Kuala Selangor (F.M.S. Agric. Dept.). It may therefore be regarded as a comparatively common species in the Malay Peninsula and well distributed. The rarity of the

<sup>1</sup> DOHERTY, 1891, p. 24, pl. 1, fig. 3.

females, however, is a point worth noticing, since in the above series there were only 5 females to 99 males.

The characters given by Fruhstorfer for *sinopion* are (i) the narrower vitreous areas and (ii) the almost entirely black ground colour of both wings beneath, which only show slight traces of a red-brown tinge. In regard to the first point, the Malayan specimens agree admirably with the Indian example figured by de Niceville.<sup>1</sup> There are, however, two males in the Raffles Museum, in which the top post-cellular hyaline streak in the fore wing is reduced to a small dash less than half the length of the lower post-cellular hyaline streak. The white marginal dots of the hind wing present a variable feature: a complete series being present in some specimens, while in others two or three only are barely visible and in one example they are absent altogether. Similarly the two small spots between the median nervules of the hind wing vary in size, and in some specimens partially or completely fuse with the larger hyaline spots immediately below the outer half of the cell.

The ground-colour beneath is certainly blackish, but in many specimens a pronounced reddish wash is very noticeable. I think, therefore, that Fruhstorfer's *sinopion* for the Malayan form must be regarded as a synonym of *plataniston*, under which name the Indian form is distinguished by Fruhstorfer. Evans<sup>2</sup>, however, retains Cramer's name *melaneus* for the Indian form. Cramer's species is supposed to have come from South China. Whether the Indian and South China forms are separable or not I do not know. Godfrey<sup>3</sup> records *plataniston* from Siam. Two examples he sends me from Me Song (Siam) are certainly inseparable from the Malayan *plataniston*. The thirty-six males in the F.M.S. Museums from Hat Sanuk and Tasan, S.W. Siam, are rather smaller than the more southern Malayan examples and they might be referred to Fruhstorfer's dry-season form *neopatra* but for the fact that they are by no means "entirely light red" beneath. The submarginal dots in these are generally though not always, purer white than in most of the Malayan examples.

*Distrib.* China and Northern India to Siam, Malay Peninsula and Java. The only Malaysian subspecies are:—

<i>D. m. plataniston</i> Fruhst.	Malay Peninsula (northwards to Siam and India).
<i>D. m. pseudomelaneus</i> Moore	Java.

Closely allied to *melaneus* come two other Malaysian species, which do not, however, occur in the Malay Peninsula:—

10. *Danaida banksi* Moore *banksi* Moore.

*Danaida banksi banksi* Fruhstorfer 1910, p. 210.

*Distrib.* The species is confined to Sumatra, Nias and Batu Islands, divided into three subspecies:—

<sup>1</sup> DE NICEVILLE, 1882, pl. V, fig. 5.

<sup>2</sup> EVANS, 1920, p. 560.

<sup>3</sup> GODFREY, 1916, p. 118.



*D. b. banksi* Moore Sumatra.  
*D. b. funeralis* Butl. Nias I.  
*D. b. mnasippus* Fruhst. Batu Is.

11. *Danaida crowleyi* Jenner-Weir.

*Danaida crowleyi* Fruhstorfer 1910, p. 210.

*Distrib.* Mountains of North Borneo and Sarawak.

12. *Danaida sita* Koll. *ethologa* Swinh.

*Danaida sita ethologa* Fruhstorfer 1910, p. 211.

*Danaüs tytia* Distant 1886, p. 408, p. 408, Tab. XLI, fig. 15.

*Loc.* Perak : Maxwell's Hill 7 ♂♂ ; Selangor, Bukit Kutu 2 ♂♂, 1 ♀ (F.M.S. Mus.). Selangor : Bukit Kutu, 2,300 ft., 1 ♂ (F.M.S. Agric. Dept.). Selangor—Pahang : Semangko Pass 2,700 ft., 5 ♂♂ (Raffles Mus.). March, May to August.

Fruhstorfer states of this subspecies that "only a few examples have hitherto been found." Thorough collecting on the mountains of the Malay Peninsula will probably show that it is well distributed and not uncommon.

*Distrib.* The species ranges from Kashmir and the Himalayas to China and Formosa and south to the Malay Peninsula.

Not recorded in Godfrey's list from Siam, but he kindly informs me (January 1921) that it has been taken in Northern Siam at Khun Than 3,600 ft. (Lat. 18° N.) and near Thaungyin river. The example sent to me from the former locality is referable to *tira* Fruhst., which is distinguished from the Eastern Himalayan form *tytia* Gray, by the absence of a thick red cell-streak in the hind wing. Fruhstorfer gives Assam and Tenasserim for the distribution of *tira*. The longer sub-apical streaks in the fore wing and the presence of two whitish sub-apical dots in the hind wing separate this subspecies clearly from the only Malaysian subspecies, *ethologa*, which lacks these dots and has the upper subapical streaks considerably shortened.

13. *Danaida tityoides* Hag.

*Danaida sita tityoides* Fruhstorfer 1910, p. 211, fig. 78d.

*Distrib.* Mountains of Sumatra.

A well-separated form for which Fruhstorfer (*l.c.*) suggests, and Rothschild<sup>1</sup> adopts, specific distinction.

Two more species of this subgenus occur in Malaysia, but not in the Malay Peninsula :—

14. *Danaida albata* Zinck. *albata* Zinck.

*Danaida albata albata* Fruhstorfer 1910, p. 209.

*Danaida albata gilva* Fruhstorfer 1910, p. 209.

*Loc.* Ongop Ongop, 4,800 ft., Idjen Massif, East Java, 13 ♂♂ (F.M.S. Mus.).

The East Java form has been separated by Fruhstorfer as *gilva*. The distinctions he gives, *viz.* smaller size, smoke-brown underside, with cell of hind wing "almost

<sup>1</sup> ROTHSCHILD, 1920, p. 147.

always darkened by a more or less extended grey-brown tinge," do not hold good. In the above series in the F.M.S. Museums the expanse of wings varies from 75-95 mm. In some, irrespective of size, the cell of the hind wing is darkened, in others entirely free from fuscous scales. The smoke-brown darkening of the underside is also a variable feature.

I follow Piepers therefore in recognizing but one form from the whole of Java.

Two other subspecies are recorded from Celebes, but in the Malaysian subregion only two subspecies occur :—

*D. a. albata* Zinck.

Java.

*D. a. adustata* Fruhst.

West Sumatra.

15. *Danaida luzonensis* Feld. *praemacaristus* Fruhst.

*Danaida luzonensis praemacaristus* Fruhstorfer 1910, p. 209, fig. 78c.

*Distrib.* Borneo.

The only two Malaysian subspecies of *D. luzonensis* are :—

*D. l. praemacaristus* Fruhst.

Borneo.

*D. l. larissa* Feld.

Java.<sup>1</sup>

Subgenus PARANTICA, Moore.

a. Fuscous streak in cell of hind wing as heavy as, or heavier than, the hyaline streaks in cell

*eryx*.

a'. Cell of hind wing hyaline partially divided by thin fuscous line

*melanoides*.

16. *Danaida eryx* Fab. *eryx* Fab.

*Danaida eryx eryx* Fruhstorfer 1909, p. 207, fig. 77b (as *aglaioides*).

*Danaida eryx maenius* Fruhstorfer 1909, p. 207.

*Danais agleoides* Distant 1882, p. 15, Tab. I, fig. 5.

A very common species ranging throughout the Malay Peninsula ; extending north through Siam to Burma and Cochin-China and south to Sumatra and Borneo. Three distinct subspecies in addition to the typical form may be recognized ; they occur in the Malaysian region :—

*D. e. borneensis* Staud.

Borneo.

*D. e. furius* Fruhst.

Java.

*D. e. erycina* Fruhst.

Nias I.

Fruhstorfer recognizes two subspecies from Borneo—*borneensis* from South-east Borneo and Pontianak, *terilus* from North Borneo ; both melanic forms, the latter particularly so, due to the great reduction of the pale green stripes and spots. As both occur together in the same localities in Sarawak I prefer to recognize but one subspecies, *borneensis* from Borneo,<sup>2</sup> retaining *terilus* as a

<sup>1</sup> PIEPERS, 1913, p. 25, pl. XIII, figs. 20a, 20b. as "*Danais aglea* Cramer."

<sup>2</sup> MOULTON, 1915, p. 202, where the Bornean form is incorrectly given as *eryx*.



form name for particularly black specimens. Sarawak specimens of this *terilus* form are practically inseparable from *erycina* from Nias. The two post-cellular streaks are not quite so obliterated in two Sarawak males, while the upper cell streak and the two below the cell are more so in one of them.

Rothschild<sup>1</sup> records a female from the West Coast of Sumatra as *eryx*. Fruhstorfer's subspecies *maenius* for this part of Sumatra is probably therefore only a melanic form occurring together with the typical form, which in Sumatra is apparently inseparable from *eryx* of the Malay Peninsula and Siam. The Bornean subspecies differs consistently from *eryx* in the general reduction of the pale green markings and particularly in the upper cell streak of the fore wing and the submarginal row of spots in both wings, which are always smaller and less developed.

17. *Danaïda aglea* Cr. *melanoides* Moore.

*Danaïda aglea grammica* Fruhstorfer 1909, p. 208.

*Danaïda aglea* Distant 1882, p. 13.

*Loc.* Pahang : Senyum—Kota Tongkat, 1 ♂ June–July (F.M.S. Mus.).

*Distrib.* North India from Kashmir to Burma, Tenasserim and Siam, with subspecies in Tonkin and Formosa. The typical form *aglea* is restricted to Ceylon, South and Central India.

Bingham<sup>2</sup> notes that de Nicéville's figure<sup>3</sup> of *aglea* is that of the northern form *melanoides*. The Pahang specimen agrees well with the markings of this figure, but differs in being smaller with narrower fore wings. Bingham, however, notices that the wings of *melanoides* are longer and narrower than in typical *aglea*. Godfrey<sup>4</sup> records *melanoides* as widely distributed and fairly common in Siam. Two Siamese specimens, kindly sent to me by Godfrey, seem inseparable from Indian *melanoides*, although the male agrees with the Pahang male in being slightly smaller, with the fore wing narrower than in the Indian male figured by de Nicéville. This character is evidently variable, as in a series of 12 males in the F.M.S. Mus. from Pulau Condore the expanse of wings varies from 61–78 mm. The fore wing from anal angle to centre of costa varies from 19–22 mm. in this series. The only female from this locality is rather darker than the Siamese form.

<sup>1</sup> ROTHSCILD, 1920, p. 147.

<sup>2</sup> BINGHAM, 1905, p. 18.

<sup>3</sup> DE NICEVILLE, 1882, p. 38, pl. 6, fig. 7.

<sup>4</sup> GODFREY, 1916, p. 118.

It is interesting to note that Cruger<sup>1</sup> mentioned *D. aglea* in a short description of Malacca butterflies as long ago as 1878. Distant<sup>2</sup> threw doubt on the record, and apparently the occurrence of *aglea* in the Malay Peninsula has remained unconfirmed until now.

Although de Nicéville (*l.c.*) shows clearly enough that *grammica* Boisd. (1836) must be restricted to the Ceylon and South Indian form which Cramer described as *aglea* in 1781 and with which it is therefore synonymous, nevertheless Fruhstorfer<sup>3</sup> retains Boisdual's name for the North Indian form. I follow Bingham,<sup>4</sup> Evans<sup>5</sup> and Godfrey<sup>6</sup> in adopting *melanoides* Moore (1883) for this northern form.

#### Subgenus RAVADEBA, Moore.

The only species of this subgenus found in the Malaysian subregion is distinguished at once from all other Danaines by the canary-yellow discal region of the hind wing.

#### 18. *Danaida aspasia* Fab. *aspasia* Fab.

*Danaida aspasia aspasia* Fruhstorfer 1909, p. 205, fig. 76d.

*Danaida aspasia* var. *crocea* Distant 1882, p. 13, Tab. I, fig. 7.

A common species found throughout the Malay Peninsula, ranging from low country to the mountains up to 3,000 ft., and probably higher. Apparently on the wing all the year round.

The typical form also occurs in Tenasserim, Siam, Sumatra<sup>7</sup> and Palawan. Other subspecies are recognized, all occurring in the Malaysian subregion:—

<i>D. a. philomela</i> Zink.	Java.
<i>D. a. rita</i> Fruhst.	Bawean I.
<i>D. a. chrysea</i> Doh.	Engano I.
<i>D. a. caulonia</i> Fruhst.	Pulau Tello, Batu Is.
<i>D. a. kheili</i> Staudg.	Nias I.
<i>D. a. shelfordi</i> Fruhst.	Borneo.

Piepers and Snellen regard the Javan form as *aspasia*. It is, as recognized by Fruhstorfer, quite distinct from the Malay Peninsula *aspasia* and must be known as *philomela*. The males have the three large post-cellular patches yellow, while in *aspasia* they are hyaline, the lowest and largest patch alone being tinged with yellow. This seems to be a constant feature of distinction in the males. In the female *philomela* the post-cellular sub-apical white streaks are much shorter and broader than in female *aspasia*.

The Bornean subspecies *shelfordi* is also well-marked and distinct.

<sup>1</sup> CRUGER, 1878, p. 29.

<sup>2</sup> DISTANT, 1882, p. 13.

<sup>3</sup> FRUHSTORFER, 1909, p. 208.

<sup>4</sup> BINGHAM, 1905, p. 19.

<sup>5</sup> EVANS, 1912, p. 560.

<sup>6</sup> GODFREY, 1916, p. 118.

<sup>7</sup> Fruhstorfer's subspecies *thargalia* for Western Sumatra is not recognized by Rothschild (1920).



## Subgenus TIRUMALA, Moore.

The males of this subgenus are distinguished by a prominent flap-like scent patch on the underside of the hind wing. The two Malaysian species may be further recognized by the absence of white spots in the hind wing in the angles formed by the bases of the median nervules. These angles are delineated by fine whitish lines in *Tirumala*.

- a.° Sub-hyaline spots and lines bluish and much reduced *septrionis*.  
 α'. Sub-hyaline spots and lines whitish and large *limniace*.

19. *Danaida melissa* Cr. *septrionis* Butl.

*Danaida melissa septrionis* Fruhstorfer 1909, p. 202  
*Danais septrionis* Distant 1882, p. 16, Tab. I, fig. 9.

*Loc.* S.W. Siam : Hat Sanuk and Tasan ; Perak : Maxwell's Hill and Kuala Kangsar ; Negri Sembilan : Bukit Tangga (F.M.S. Mus.). Perak : Kuala Lenggong (F.M.S. Agric. Dept.).

Out of 18 in the F.M.S. Museums, 16 are males.

*Distrib.* India to Cochin-China, Siam, the Malay Peninsula and Sumatra. Other Malaysian subspecies are:—

<i>D. m. melissa</i> Cr.	Java.
<i>D. m. rufiventris</i> Fruhst.	Nias I.
<i>D. m. microsticta</i> Butl.	Borneo.
<i>D. m. suanetes</i> Fruhst.	Balabac I.

Several other subspecies range further East as far as Fiji and the New Hebrides.

20. *Danaida limniace* Cr. *limniace* Cr.

A single male in the Raffles Museum, unfortunately without locality label, may perhaps constitute the first record of this species from the Malay Peninsula, since the greater part of the butterfly collection in this Museum comes from that country.

Godfrey<sup>1</sup> records typical *limniace* from Siam (Lat. 13° N.) as "not very common. Taken only on the Petchaburi River and in the Sriracha forest."

The Raffles Museum specimen agrees well with a Siamese male kindly sent to me by Godfrey and with Bingham's description and figure of the Indian form.<sup>2</sup>

<sup>1</sup> GODFREY, 1916, p. 118.

<sup>2</sup> BINGHAM, 1905, p. 16, fig. 5.

Fruhstorfer<sup>1</sup> comments on the curious gap in its distribution between the Nicobars and Java. Since then, however, I have recorded it from Borneo<sup>2</sup>; one would expect to find it yet in the Malay Peninsula and Sumatra. The Malaysian subspecies are:—

<i>D. l. limniace</i> Cr.	China south to Siam and ? Malay Peninsula.
<i>D. l. conjuncta</i> Moore	Java.
<i>D. l. kuchingana</i> Moulton	Borneo.

Other subspecies occur in India, Ceylon and Celebes.

Piepers<sup>3</sup> merges *limniace* with *melissa* and records intermediates in Java.

#### Subgenus ANOSIA, Hübn.

#### 21. *Danaida archippus* Fab.

*Danaida archippus* Fruhstorfer 1910, p. 193.

*Loc.* Penang and Java (Fruhstorfer).

I have seen none in local collections. Piepers<sup>4</sup> doubts its occurrence in Java. This American butterfly, well-known as "The Wanderer," has reached many other countries in the East besides the two Malaysian localities given by Fruhstorfer.

#### Subgenus LIMNAS, Hübn.

The Malay Peninsula species of this subgenus and the next are distinguished from all the fore-going *Danaines* by the fulvous ground-colour of the fore wing. This *Limnas* species may be recognized by the colouration of the veins which are fulvous like the ground-colour, not heavily defined in black as in the species of the next subgenus, *Danaida*.

#### 22. *Danaida chrysippus* Linn. *bataviana* Moore.

*Danaida chrysippus bataviana* Fruhstorfer 1910, p. 194.

*Danais chrysippus* Distant 1882-86, pp. 20, 408, Tab. I, fig. 10 & XL, fig. 13.

*Loc.* Selangor: Kuala Selangor and Kuala Lumpur (F.M.S. Agric. Dept.). Singapore 1 ♂, 3 ♀ (Raffles Mus.).

Fruhstorfer records the lighter yellow continental Indian form *chrysippus* in North-East Sumatra. Godfrey<sup>5</sup> records it as "common everywhere all the year round" in Siam. Distant (*l.c.*) records it from Penang, Province Wellesley and Singapore. It is apparently rare in the Malay Peninsula. I have seen none from local collections.

Distant also records a variety with whitish hind wings, *alcippoides*, from Singapore. The F.M.S. Agricultural Department have a series of this white form from Kuala Lumpur, bred from larvae found on a large *Calotropis*

<sup>1</sup> FRUHSTORFER, 1909, p. 204.

<sup>2</sup> MOULTON, 1915(a), p. 97.

<sup>3</sup> PIEPERS, 1913, p. 30, pl. XIV, figs. 25a, 25b, 25c.

<sup>4</sup> PIEPERS, 1913, p. 23.

<sup>5</sup> GODFREY, 1916, p. 117.



growing in the Agricultural Department Plantation in January 1919. They agree well with Distant's figure of a Singapore male, except that the white expanse, the hind-marginal row of white spots in the hind wing and the two white spots in the outer orange-brown region of the fore wing are more developed.

The record of the dark brown *batavia* in Singapore and Kuala Selangor (1 ♀) is of interest in view of its occurrence also in Western Sumatra. The Singapore male agrees well with a male from Java.

The distribution of *chrysippus* in Malaysia is as follows :—

<i>D. c. chrysippus</i> Linn.	Malay Peninsula, Borneo, N. E. Sumatra.
<i>D. c. vigeli</i> Heyl.	Pulau Bras (N. W. Sumatra).
<i>D. c. clarippus</i> Weym.	Nias I.
<i>D. c. bataviana</i> Moore	Java, W. Sumatra and Malay Peninsula (Singapore and Kuala Selangor).

Other subspecies extend the range of this species to Europe, Africa and Australia.

In the Malaysian subregion the white form *alcippoides* is known from Sumatra, as well as from Singapore and Kuala Lumpur.

#### Subgenus DANAIDA, Latr.

The Malay Peninsula forms may be separated thus :—

- a. Orange-brown ground-colour below sub-median nervure of fore wing above *plexippus*.
- b. Ground-colour of hind wing pale orange-brown *f. typica*.
- b<sup>1</sup>. Ground-colour of hind wing white *f. intermedia*.
- b<sup>2</sup>. Ground-colour of hind wing pale orange-brown, very slightly suffused with white *f. connectens*.
- a<sup>1</sup>. Brown fuscous below sub-median nervure of fore wing.
- b. Cell and post-discal streaks of hind wing white *hegesippus*.
- b<sup>1</sup>. Only the outer half of cell of hind wing white, no post-discal white streaks *malayana*.

#### 23. *Danaida plexippus* Linn. *plexippus* Linn.

*Danaida plexippus intermedia* Fruhstorfer 1910, p. 195.

*Danais genulia* Distant 1882-86, pp. 18, 408, Tab. II, figs. 2, 3.

*Loc.* S.W. Siam : Hat Sanuk and Tasan ; Perak : Kuala Kangsar, Taiping, Selangor : Ulu Gombak, Ulu Langat, Kuala Lumpur ; Pahang : Kuala Tahan ; Negri Sembilan : Bukit Tangga (F.M.S. Mus.). Singapore (Raffles Mus.).

*Distrib.* India to China and the Malay Peninsula, with subspecies scattered through the Malay Archipelago to Australia. Those recognized from Malaysia are —

<i>D. p. plexippus</i> Linn.	Malay Peninsula.
<i>D. p. sumatrana</i> Moore	Sumatra.
<i>D. p. niasicus</i> Fruhst.	Nias I.
<i>D. p. intensa</i> Moore	Borneo, Java, Bali, Bawean.

The forms with white, instead of fulvous, ground-colour in the hind wing should be known as form *intermedia* Moore. They occur together with the typical fulvous hind-winged form in Tonkin, Saigon, Siam and the Malay Peninsula, and therefore cannot be regarded as a separate subspecies. Distant<sup>1</sup> recognized this in 1886, but Fruhstorfer<sup>2</sup> records *intermedia* as a "geographical race" confined to the Malay Peninsula and Singapore (where he states it is the principal form) and as an "aberration" occurring in the dry season in Siam, Saigon and Tonkin.

It seems to me preferable to reserve subspecific names for *geographical races inhabiting separate areas*. In this case two well-marked forms occur together over a wide range of country. To recognize them by *form* names rather than as *distinct subspecies* appears to me the sounder policy. If one were a resident form and the other a visitor, as occurs in some species of birds, (*e.g.* the Eastern Roller, *Eurystomus orientalis* Linn., which has the typical form *orientalis* resident in Malaysia, and a migratory subspecies *calonyx*, which is also found at certain times of the year in Malaysia together with *orientalis*), subspecific distinction would be justified. There is, however, no evidence to show that either form of *plexippus* is an occasional visitor to our subregion. It is to be supposed in fact that the two forms will occur in one brood. A breeding experiment to test this would be of interest. On the other hand it might be argued with some justice that individuals which produce dimorphic broods in one area are subspecifically distinct from individuals in another area where only one pattern of progeny is produced, not two.

One male in the F.M.S. Museums from Kuala Kangsar has a very slight development of white in the discal region of the hind wing above and is thus intermediate between the typical form with completely fulvous hind wing and the white hind winged form *intermedia*. This form may be termed *connectens* f. nov.

23. *Danaida plexippus* Linn. *intensa* Moore.

*Danaida plexippus intensa* Fruhstorfer 1910, p. 195.

The distribution of this subspecies, *viz.* Borneo, Java, Bali and Bawean, is rather curious.

<sup>1</sup> DISTANT, 1886, p. 408.

<sup>2</sup> FRUHSTORFER, 1910, p. 195.



A female from Mt. Kinabalu, British North Borneo, in the Raffles Museum, is very similar to one from the island of Krakatau (between Java and Sumatra) in the Buitenzorg Museum. The white spots in the hind-margin of the hind wing are slightly more pronounced above and below in the latter specimen and in two males from the same locality.

24. *Danaida melanippus* Cr. *hegesippus* Cr.

*Danaida melanippus hegesippus* Fruhstorfer 1910, p. 196.

*Danais melanippus* var. *hegesippus* Distant 1882, p. 19, Tab. II, fig. 1.

A common form throughout the Malay Peninsula, Sumatra, Borneo and the Natuna Islands, with other subspecies ranging as far as India, Java and Celebes. In Malaysia the following subspecies are recognized :—

<i>D. m. melanippus</i> Cr.	Java.
<i>D. m. hegesippus</i> Cr.	Malay Peninsula, Borneo, Sumatra and Natuna Is.
<i>D. m. umbrosus</i> Fruhst.	Pulau Tello, Batu Is.
<i>D. m. eurydice</i> Butl.	Nias I.
<i>D. m. keteus</i> Hag.	Mentawai Is.
<i>D. m. pietersi</i> Doh.	Engano I.
<i>D. m. insularis</i> Moulton	Krakatau I.

Of 60 specimens in the F.M.S. Museums, 43 are males, 17 females. In the Raffles Museum there are 11 males and 3 females. Apparently on the wing all the year round.

There is a melanistic tendency noticeable in the hind wings of certain males which have the white post-cellular streaks, especially those immediately above the scent-patch, much reduced. These are typical *hegesippus*, but there are several examples in the above series which agree admirably with Fruhstorfer's figure of *D. m. indicus*.<sup>1</sup> This form he restricts to Tenasserim, Burma, Bengal and Cochin-China. Godfrey<sup>2</sup> regards the Siamese form as *hegesippus*. The three he sends me are typical *hegesippus*, differing particularly from Fruhstorfer's figure of *indicus* in the reduced sub-apical white markings of the fore wing. I doubt whether the Indian form can be maintained as a separate subspecies.

24a. *Danaida melanippus* Cr. *insularis* subsp. nov

Differs from Javan *melanippus* in the hind wing, which is noticeable for its white cell, contrasting with three pale ferruginous streaks bordering the submedian and internal nervures. The post-cellular streaks are white and much reduced, but shaded posteriorly with ferruginous scales; the white spots of the hind-marginal border are reduced. The whole of the discal region of the hind wing below is pale ferruginous, not white as in *hegesippus*.

<sup>1</sup> FRUHSTORFER, 1910, p. 196, fig. 77c.

<sup>2</sup> GODFREY, 1916, p. 117.

This Krakatau form suggests a possible hybrid between *hegesippus* and *melanippus*. Possibly stragglers of *melanippus* from Java and *hegesippus* from Sumatra have reached Krakatau since the great eruption and have given rise to this new race.

From the Engano form *pietersi*<sup>1</sup> it is easily distinguished. That form has a brown cell centre and brown inter-nervular streaks on the hind wing; there is also a powdering of grey-violet on the white sub-apical patches of the fore wing which is absent in *insularis*.

*Exp. al.* 67 mm.

*Type* ♂. Krakatau, December 1919. In Zoological Museum, Buitenzorg, Java.

25. *Danaida affinis* Fab. *malayana* Fruhst.

*Danaida affinis malayana* Fruhstorfer 1910, p. 201, fig. 77d.

*Danaïs abigar* Distant 1886, p. 409, Tab. XLII, fig. 11.

*Loc.* Selangor : Kuala Selangor, 2 ♂ ♂, (F.M.S. Agric. Dept.). Johore 1 ♂. (Raffles Mus.).

*Distrib.* This subspecies is confined to Siam and the Malay Peninsula. The species, however, has a wide range extending east and south to the Philippines, Australia and the Solomon Islands. The Malaysian forms are :—

*D. a. fuliginosa* Hag.

Bawean I.

*D. a. artemice* Cr.

Java.

*D. a. malayana* Fruhst.

Malay Peninsula (and Siam).

Fruhstorfer (*l.c.*) states that for a decade only one male was known "whose locality, the Malay Peninsula, was moreover still doubtful." The record of a male from Johore and two more from Kuala Selangor is therefore of interest. Distant (*l.c.*) records its discovery in Province Wellesley. The Kuala Selangor males agree well with Fruhstorfer's figure and with Siamese males kindly sent to me for comparison by Godfrey. Distant's figure of the Province Wellesley female agrees with Siamese females, except that the white discal region of the hind wing is not so sharply defined in his figure.

The Johore male in the Raffles Museum differs so much from *malayana* that one is tempted to give this southern form subspecific distinction. I prefer, however, to keep it provisionally under *malayana* until the female and more males are collected. The white discal region of the hind wing is much restricted as in Fruhstorfer's figure of *tambora* (fig. 77d.), the outer half is brown, with the veins slightly emphasized with darker brown, not black; the sex-mark does not penetrate the white discal region as in *malayana*. The basal half of the cell in the hind wing is brown, whereas in *malayana* this brown colouring seldom

<sup>1</sup> DOHERTY, 1891, p. 23, pl. I, fig. 1.



covers so much as the basal third. The light spots forming a double hind-marginal border to the hind wing are smaller than in *malayana* and the inner row is incomplete on the upper side.

Fruhstorfer states that *malayana* is fairly numerous in Bangkok, and that it will, in his opinion, certainly extend still further along the coast of Siam.

25a. *Danaida affinis* Fab. *artenice* Cr.

*Danaida affinis artenice* Fruhstorfer 1910, p. 200.

Fruhstorfer comments on the rarity of this form. The Director of the Zoological Museum, Buitenzorg, has sent me for examination three males and one female from Purmerend and Edam, Batavia Bay. They agree well with Piepers' figure<sup>1</sup>; they measure 55–65 mm. across the wings against 50 mm. recorded by Fruhstorfer. Piepers<sup>1</sup> states it is common in the lower districts of Batavia.

The subgenus *Danaida* contains one other species from the Malaysian subregion in addition to the above.

26. *Danaida lotis* Cr. *lotis* Cr.

*Danaida lotis lotis* Fruhstorfer 1910, p. 197.

*Distrib.* Borneo, with other subspecies from Celebes and the Philippines. The only Malaysian subspecies are :—

<i>D. l. lotis</i> Cr.	Borneo.
<i>D. l. mezentius</i> Fruhst.	N. E. Borneo and Balabac I.
<i>D. l. lotina</i> Fruhst.	Natuna Is.

Genus EUPLOEA, Fab.

The following key, which is based on male characters only and therefore does not apply to females, will serve to distinguish the different subgenera, or "groups" as Fruhstorfer regards them, into which this genus is divided :—

- a. Without pale patch of specialized scales in the costal region of hind wing.
  - b. Without sexual brand on fore wing *Menama.*
  - b<sup>1</sup>. With one well-defined sexual brand between median and internal nervures of fore wing *Crastia.*
  - b<sup>2</sup>. With two well-defined sexual brands between median and internal nervures of fore wing *Stictoploea.*
- a<sup>1</sup>. With pale patch of specialized scales in the costal region of the hind wing of the male.
  - b. Patch quite small, in cell of hind wing below the origin of first subcostal nervule *Trepsichrois.*

<sup>1</sup> PIEPERS, 1913, p. 33, pl. XIV, fig. 26.

- b*<sup>1</sup>. Patch large, covering half or more than half the upper portion of cell in hind wing.
- c*. Fore wing beneath without sexual spot below first median nervule.
- d*. Fore wing rounded. *Exp. al.* 65-70 mm. *Calliploea*.
- d*<sup>1</sup>. Fore wing more pointed. *Exp. al.* 105-110 mm. *Macroploea*.
- c*<sup>1</sup>. Fore wing beneath with small patch of specialized scales below first median nervule *Salpinx*.

#### Subgenus MENAMA, Moore.

Fruhstorfer<sup>1</sup> merges this subgenus under the one group *Crastia*. The absence of any sexual brand in the male, however, seems to justify subgeneric separation of the three species thus characterized from those in which there are one or more well-defined sexual brands. I therefore follow Bingham<sup>2</sup> in retaining this subgenus distinct from the subgenus *Crastia*. De Nicéville<sup>3</sup> follows Butler<sup>4</sup> in using Hubner's name *Crastia* for the species here placed under the subgenus *Menama*, i.e. those characterized by the absence of a sexual brand in the male.

The remaining species included by Fruhstorfer in his group *Crastia*, and by Butler and de Nicéville in their groups *Euploea*, Bingham refers to his subgenus *Crastia*; a course which I adopt here.

The species of *Menama* found in the Malay Peninsula may be distinguished as follows :—

- a*. Colouring above black fuscous without purple iridescence; hind-margin fore wing with white spots, hind-margin hind wing with double row of small white spots.
- b*. Sub-apical spots in fore wing large. *Exp. al.* 88-98 mm. Apex fore wing rounded *marsdeni*.
- b*<sup>1</sup>. Sub-apical spots in fore wing not large, very slightly more pronounced than inner row of post-discal white spots. *Exp. al.* 110-118 mm. *malayica*.
- a*<sup>1</sup>. Fore wing deep iridescent blue-purple on black, without spots in male and only a few small spots in female, hind wing both sexes marked with double row of sub-marginal spots, those of the inner row elongate and heavier *modesta*.

#### 27. *Euploea crameri* Luc. *marsdeni* Moore.

*Euploea crameri marsdeni* Fruhstorfer 1910, p. 230.

*Euploea bremeri* Distant 1882, p. 23, Tab. II, fig. 4.

*Euploea marsdeni* Distant 1886, p. 411, Tab. XXXIX, fig. 1.

<sup>1</sup> FRUHSTORFER, 1910, p. 226.

<sup>2</sup> BINGHAM, 1905, p. 23.

<sup>3</sup> DE NICEVILLE, 1882, p. 58.

<sup>4</sup> BUTLER, 1878, p. 297.



*Loc.* Langkawi Islands; Kedah: Kedah Peak, Tioman Island; Selangor: Ulu Langat (F.M.S. Mus.). Singapore (Distant).

*Distrib.* The type form *crameri* comes from Borneo. The species is reduced to several subspecies ranging from India through Malaysia as far East as Bali. The Malaysian subspecies are:—

<i>E. c. crameri</i> Luc.	Borneo.
<i>E. c. marsdeni</i> Moore	Malay Peninsula.
<i>E. c. heylaertsi</i> Moore	Sumatra.
<i>E. c. niasica</i> Moore	Nias I.
<i>E. c. mentavica</i> Hag.	Mentawai Is.
<i>E. c. tenggerensis</i> Fruhst.	East Java (Tengger Mts.).
<i>E. c. snelleni</i> Moulton	West and Central Java.
<i>E. c. pagenstecheri</i> Hag.	Bawean I.
<i>E. c. singaradha</i> Fruhst.	Bali.
<i>E. c. lanista</i> Fruhst.	Natuna Is.
<i>E. c. jedja</i> Fruhst.	Banguey I.

The Tenasserim subspecies *bremeri* and the Sumatran *heylaertsi* appear to me hardly separable from the Malay Peninsula *marsdeni*.

The two males from Langkawi Islands do not differ from the mainland form. The only male from Tioman Island on the other hand is noticeable for the almost total suppression of the hind-marginal border of white spots in both wings. If this reduction is normal in males from that island, subspecific separation would certainly be justified. The two females from Tioman, however, do not differ from mainland females.

27a. *Euploea crameri* Luc. *snelleni* subsp. nov.

Snellen<sup>1</sup> notes that the typical form *crameri* of Borneo "differs from the Javanese form in being larger (80–82 mm. against 70–77 mm.) and in being of a somewhat darker colour. The white spots on the fore wings, moreover, are almost limited to the apex, being also larger."

As Piepers points out, these notes do not agree with Fruhstorfer's description of *tenggerensis*, which we may regard as restricted to the Tengger Mts. in East Java. For the ordinary Javanese form of *crameri*, which is thus without a name, I propose the name *snelleni*. Piepers (*l.c.*) figures both sexes.

28. *Euploea malayica* Butl. *malayica* Butl.

*Euploea malayica malayica* Fruhstorfer 1910, p. 230, fig. 80b.

*Euploea malayica* Distant 1882, p. 22, Tab. II, fig. 7.

*Loc.* Perak: Taiping, Kampar; Selangor: Bukit Kutu; Pahang: Kota Tongkat and Senyum (F.M.S. Mus.). Pahang: Kuala Krau, Jerantut (F.M.S. Agric. Dept.). Selangor—Pahang: Semangko Pass, 2,700 ft.; Singapore (Raffles Mus.).

<sup>1</sup> Quoted by PIEPERS, 1913, p. 7, pl. XI, figs. 3a, 3b.

*Distrib.* With the exception of one subspecies in Palawan, this species is confined to the Malaysian subregion, split up into the following subspecies :—

<i>E. m. malayica</i> Butl.	Malay Peninsula and Sumatra.
<i>E. m. stollii</i> Weym.	Nias I.
<i>E. m. hypanis</i> Fruhst.	Java.
<i>E. m. scudderi</i> Butl.	Borneo.
<i>E. m. roduna</i> Fruhst.	Banguay I.

29. *Euploea modesta* Butl. *modesta* Butl.

*Euploea modesta modesta* Fruhstorfer 1910, p. 231.

*Loc.* S.W. Siam : Tasan and Hat Sanuk 4♂♂ ; Langkawi Islands 2♀♀ (F.M.S. Mus.). Perak : 65th mile on the Kuala Kangsar—Grik Road, "on elephant dung" (F.M.S. Agric. Dept.<sup>1</sup>).

*Distrib.* The typical form *modesta* has been recorded from South Annam, Siam and Tenasserim only. The above-mentioned localities for specimens in the F.M.S. Museums and Agricultural Department mark a southward extension to its range hitherto unknown. Only two other subspecies, both very distinct, are known :—

<i>E. m. buxtoni</i> Moore	Sumatra.
<i>E. m. lorzae</i> Moore	Borneo.

In addition to the foregoing species of this subgenus, the following occur in Malaysia, although they are not represented in the Malay Peninsula :—

30. *Euploea climena* Cr. *sepulchralis* Butl.

*Euploea climena sepulchralis* Fruhstorfer 1910, p. 226.

*Euploea climena terissa* Fruhstorfer 1910, p. 226.

*Distrib.* Java and Bawean Island, with the following Malaysian subspecies :—

<i>E. c. enganensis</i> Doh.	Engano I.
<i>E. c. elwesiana</i> de Nicév.	Bali (Lombok and Sumbawa).
<i>E. c. macleari</i> Butl.	Christmas I.

Piepers<sup>2</sup> shows that *sepulchralis* Butl. must cover the forms from East Java, separated by Fruhstorfer as *terissa*, in addition to those from West Java.

31. *Euploea oceanis* Dohert.

*Euploea oceanis* Fruhstorfer 1910, p. 228, fig. 81c.

*Distrib.* Engano Island only.

32. *Euploea moorei* Butl. *moorei* Butl.

*Euploea moorei moorei* Fruhstorfer 1910, p. 229.

<sup>1</sup> A specimen from the F.M.S. Agricultural Department is labelled "P.B.R. coll. A." The Director of the Department informs me that this is probably from Bukit Kutu in Selangor.

<sup>2</sup> PIEPERS, 1913, p. 4.



*Distrib.* Sumatra, with the following additional subspecies in Malaysia :—

<i>E. m. brookei</i> Moore	Borneo.
<i>E. m. morrissi</i> Hag.	Mentawai Is.
<i>E. m. thiemei</i> Fruhst.	Nias I.

33. *Euploea deheeri* Doh. *lamos* Fruhst.

*Euploea deheert lamos* Fruhstorfer 1910, p. 231.

*Distrib.* East Java, with other subspecies outside the Malaysian subregion from Lombok, Sumbawa and Flores.

Subgenus *CRASTIA*, Hübn.

Key to the Malay Peninsula forms :—

- a. With marginal spots on fore wing.
  - b. Inner row of marginal spots white and large *graminifera*.
  - b'. Marginal spots small or obsolescent, yellowish; apex of fore wing violaceous *godarti*.
- a'. Without marginal spots on fore wing.
  - b. White streaks of sub-marginal row in hind wing above long, not sharply defined inwardly.
    - c. Male sexual brand on fore wing small; female without white spots on fore wing above. *Exp.* al. 80–90 mm. *gardineri*.
    - c'. Male sexual brand on fore wing larger; female with four white spots on fore wing above. *Exp.* al. 98–102 mm. *monticola*.
  - b'. White streaks of sub-marginal row in hind wing above shorter and well-defined. Male sexual streak much larger *menetriesi*.

34. *Euploea core* Cr. *graminifera* Moore.

*Euploea core graminifera* Fruhstorfer 1910, p. 236.

*Euploea distantii* Distant 1882, p. 32, Tab V, fig. 9, ♂.

*Loc.* Singapore (Raffles Mus.). Province Wellesley (Distant).

Fruhstorfer restricts *core* to India, with subspecies in the Himalayas, Ceylon and the above for the Malay Peninsula. Moore<sup>1</sup> gives no more definite locality for his type of *graminifera*. Fruhstorfer (*l.c.*) states it is unknown to him in nature.

Moore describes *distantii* from Sumatra and gives, as an additional locality, the Malay Peninsula (Province Wellesley). Fruhstorfer suggests that *distantii* is the representative of *core* on Sumatra, but he retains the two as separate species. The single Singapore male in the Raffles Museum agrees well with Moore's figure of *distantii*,<sup>1</sup> which in turn is very close to the Sumatran form. I think there-

<sup>1</sup> MOORE, 1883, pp. 277–278, pl. XXIX, fig. 6.

fore that it is preferable to regard both *graminifera* and *distanti* as subspecies of the continental *core*. The Malaysian subregion thus has :—

<i>E. c. graminifera</i> Moore	Malay Peninsula.
<i>E. c. distanti</i> Moore	Sumatra.

Swinhoe's *circuita* from Tonkin, Cochin-China and Siam<sup>1</sup> should also be included as a subspecies of *core*.

### 35. *Euploea godarti* Luc.

*Euploea godarti* Distant 1883, p. 34, Tab. III, fig. 8.

*Loc.* Singapore (coll. Godman and Salvin).

The only known example from the Malay Peninsula is recorded by Distant, who states that it is labelled "Singapore," and was received from Mr. Druce.

*Distrib.* Burma, Tenasserim and Siam.<sup>2</sup>

### 36. *Euploea layardi* Druce.

*Euploea godarti layardi* Fruhstorfer 1910, p. 236.

Not recorded from the Malay Peninsula, but common in Siam and probably extending south on the mainland to Lat. 10° N.

A series of 16 in the F.M.S. Mus. from Pulau Condore (Lat. 9° N.) off the S.E. coast of Cochin-China is referable to this form, which Fruhstorfer and Godfrey unite with the preceding species *E. godarti*.

I agree with Bingham in keeping them separate, as this series differs uniformly from *godarti* in the sexual brand on the fore wing of the male. This is broader and double the length of that in *godarti*. It further differs in the absence of a lilaceous patch in the apex of the fore wing so prominent in *godarti*, and in the straighter inner row of submarginal spots in the hind wing.

Godfrey states that *godarti* is very common in Siam, but that the form *layardi* is not. Breeding experiments to prove the conspecific identity of the two forms are needed.

### 37. *Euploea alcathoe* Godt. *gardineri* Fruhst.

*Euploea alcathoe gardineri* Fruhstorfer 1910, p. 237.

*Euploea menetriesi* Distant 1882, p. 34, Tab. III, figs. 4, 5.

*Loc.* Kedah : Kedah Peak ; Kelantan : Kuala Krai ; Perak : Batang Padang, Kampar and Maxwell's Hill ; Selangor : Ulu Langat and Kuala Lumpur ; Pahang : Kuala Tahan ; Negri Sembilan : Bukit Tangga (F.M.S. Mus.). Selangor : Bukit Kutu (F.M.S. Agric. Dept.). Perak : Gunong Kledang, 2,646 ft. ; Singapore (Raffles Mus.).

#### 37a. *Euploea alcathoe* Godt. *monticola* subsp. nov.

Differs from *gardineri* in the larger size and more developed white sub-marginal spots and streaks of the hind

<sup>1</sup> GODFREY records it from Siam (*in litt.* January, 1921).

<sup>2</sup> *Vide* next species.



wing, and more pronounced sex brand in the fore wing of the male. The female has four white spots on the fore wing above, one above the apex of the cell, one in the lower distal corner of the cell, one just beyond and one just below this cell spot.

*Exp. al.* ♂ 100–102 mm., ♀ 98 mm.

*Types.* Male and female from Kedah Peak in F.M.S. Museums.

*Loc.* Kedah : Kedah Peak, November–December 1915 (F.M.S. Mus.). Selangor : Bukit Kutu, 3,457 ft., April 1915 (Raffles Mus.).

I regard this with some doubt as a mountain form of *alcathoe*, since there are three other specimens in the F.M.S. Museums (1 ♂, 2 ♀) of the typical *gardineri* form from the same locality. It is possible that these were taken at the foot of the mountain and that *monticola* is restricted to the higher altitudes. The appearance of *monticola* however is in some ways so strikingly different from *gardineri* that it may perhaps turn out to be a distinct species.

*Distrib.* *E. alcathoe*, split into several subspecies, ranges from India through Burma, Siam and Malaysia as far east as Lombok. In the Malaysian subregion the following subspecies may be recognized :—

<i>E. a. gardineri</i> Fruhst.	Malay Peninsula.
<i>E. a. monticola</i> Moulton	Malay Peninsula Mts.
<i>E. a. martinus</i> Fruhst. <sup>1</sup>	Sumatra.
<i>E. a. simplex</i> Fruhst.	Nias I.
<i>E. a. pahakela</i> Doh.	Engano I.
<i>E. a. arasa</i> Fruhst.	Mentawai Is.
<i>E. a. alcathoe</i> Godt.	Java, Bali (and Lombok).
<i>E. a. uniformis</i> Moore	Borneo.
<i>E. a. salitra</i> Fruhst.	Natuna Is.
<i>E. a. lucania</i> Fruhst.	Pulau Tello, Batu Is.

### 38. *Euploea deione* Westw. *menetriesi* Feld.

*Euploea deione menetriesi* Fruhstorfer 1910, p. 238.

*Euploea pinwilli* Distant 1882, p. 35, Tab. III, figs. 9 & 10.

*Loc.* Kedah : Gurun ; Kelantan : Kuala Krai ; Perak : Batang Padang, Kampar, Kuala Kangsar and Taiping ; Selangor : Ulu Langat, Ayer Itam (F.M.S. Mus.). Selangor—Pahang : Semangko Pass, 2,700 ft. (Raffles Mus.).

*Distrib.* This species ranges from Sikkim, Burma and Siam south through the Malayan Islands to Sumbawa and Palawan. In the Malaysian subregion the following subspecies occur :—

<i>E. d. menetriesi</i> Feld.	Malay Peninsula.
<i>E. d. epiphaneia</i> Fruhst.	Sumatra.
<i>E. d. kheili</i> Weym.	Nias I.
<i>E. d. seitzi</i> Hag.	Mentawai Is.
<i>E. d. pasina</i> Fruhst.	Pulau Tello, Batu Is.
<i>E. d. wallengreni</i> Feld.	Java.
<i>E. d. zonata</i> Druce	Borneo.
<i>E. d. masina</i> Fruhst.	S. E. Borneo.
<i>E. d. transpectus</i> Moore	Billiton.

<sup>1</sup> ROTHSCHILD, 1920, p. 148 does not recognize *vonara* Fruhst. for the West Sumatran form as distinct from *martinus*.

The intensive blue reflection in the male in *menetriesi* is not very noticeable in ten males from the Malay Peninsula compared with the Siamese subspecies *limborgi* Moore, of which there is one very beautiful male from Hat Sanuk or Tasan, S.W. Siam, in the F.M.S. Museums. One male from Selangor however approaches *limborgi* in the more pronounced and better defined white spots of the hind wing above.

One other species of this subgenus occurs in the Malaysian subregion, viz :—

39. *Euploea haworthi* Luc. *haworthi* Luc.

*Euploea haworthi haworthi* Fruhstorfer 1910, p. 237.

*Distrib.* The typical form occurs on Java and Bali with a subspecies on Sumatra :—

*E. h. haworthi* Luc. Java and Bali.

*E. h. inconspicua* Moore Sumatra.

Subgenus STICTOPLOEA, Butl.

The two sexual brands in the fore wing of the male and the very deep blue reflection on the fore wings of both sexes at once make the only Malay Peninsula species of this subgenus easily recognizable.

40. *Euploea dufresne* Godt. *harrisi* Feld.

*Euploea harrisi harrisi* Fruhstorfer 1910, p. 246.

*Euploea grotel* Distant 1882, p. 36, Tab. III, fig. 3.

*Euploea harrisi* Distant 1886, p. 411.

*Loc.* Kedah : Kedah Peak, 1 ♂ ; Perak : Kuala Kangsar 5 ♂ ♂, 1 ♀ ; Pahang : Senyum and Kota Tongkat, 1 ♂ (F.M.S. Mus.). Perak : Sulphur Springs, Grik, 3 ♂ ♂ (F.M.S. Agric. Dept.). Singapore 1 ♀ (Raffles Mus.).

*Distrib.* This subspecies extends north to Siam, Burma and Cochin-China.<sup>1</sup>

Fruhstorfer (*l.c.*) keeps as separate species : *harrisi* for the continent, *lacordairei* for the Indo-Malayan islands and *dufresne* for the Philippine Islands. It seems to me preferable to treat them as one species, subspecifically distinct from one another in their own particular regions. I therefore adopt the oldest name *dufresne* Godt. for the species instead of *harrisi*. Fruhstorfer evidently inclines to the same view, as he writes : "Whether all the three species now regarded as separate belong to one species is a question which can only be solved by further anatomical research." In discussing Austro-Malayan forms he writes : "But in spite of all the statements to the contrary, there is

<sup>1</sup> One example in the F.M.S. Mus. from Pulau Condore is referable to Moore's melanotic aberration *crowleyi* originally described from Tenasserim.

<sup>2</sup> FRUHSTORFER, 1910, pp. 246-7.



also in New Guinea as well as in India and on the Malayan islands only one *Stictoploea* in each district, which excludes the presence of a second species." In his appendix to this subfamily, however, published in 1911<sup>1</sup> he records a second species from the Philippines.

The Malaysian subregion has the following subspecies :—

<i>E. d. harrisi</i> Feld.	Malay Peninsula (to Siam, Burma and Cochin-China).
<i>E. d. mithrenes</i> Fruhst.	Sumatra.
<i>E. d. convallaria</i> Thieme	Nias I.
<i>E. d. nica</i> Fruhst.	Engano I.
<i>E. d. tyrianthina</i> Moore	Borneo.
<i>E. d. lacordairei</i> Moore	Java.
<i>E. d. baweanica</i> Fruhst.	Bawean I.

#### Subgenus TREPSICHOIS, Hübn.

The small patch of specialized scales in the cell of the hind wing in the male and the white inter-nervular stripes of the hind wing in the female are two striking characters which will serve to distinguish the only Malay Peninsula species of this subgenus.

#### 41. *Euploea mulciber* Cr. *mulciber* Cr.

*Euploea mulciber mulciber* Fruhstorfer 1910, p. 250.

*Euploea midamus* Distant 1882, p. 24, Tab. II, figs. 8 & 9.

*Euploea mulciber* Distant 1882, p. 25, Tab. III, figs. 1 & 2.

Out of 156 examples from the F.M.S. Museums of this common and widely distributed butterfly 141 were males, 15 females. In the Raffles Museum there are 29 males and 11 females. Both series cover the Malay Peninsula from Kedah south to Singapore. There are none from Tioman Island or Langkawi Islands in these local collections.

*Distrib.* India to China and the Malay Peninsula, with several well-marked subspecies in the Malay Archipelago. Those occurring in the Malaysian subregion are :—

<i>E. m. mulciber</i> Cr.	Malay Peninsula (to China and India).
<i>E. m. vandeventeri</i> Forbes	Sumatra.
<i>E. m. verhuelli</i> Moore	Nias I.
<i>E. m. maassi</i> Hag.	Mentawai Is.
<i>E. m. batunensis</i> Fruhst.	Batu Is.
<i>E. m. malakoni</i> Doh.	Engano I.
<i>E. m. basilissa</i> Cr.	Java and Bawean I.
<i>E. m. portia</i> Fruhst.	Borneo and Natuna Is.

#### Subgenus EUPLOEA, Fab.

a. Small species with rounded fore wing. al. 70 mm.	Exp. <i>ledereri</i> .
a'. Large species with pointed fore wings. al. 110-120 mm.	Exp. <i>rhoebus</i> .

<sup>1</sup> FRUHSTORFER, 1911, pp. 276-277.

42. *Euploea mazares* Moore *ledereri* Feld.*Euploea mazares ledereri* Fruhstorfer 1910, p. 252.*Euploea ledereri* Distant 1882, p. 26, Tab. II, fig. 10.

*Loc.* S.W. Siam : Hat Sanuk ; Perak : Maxwell's Hill, Kuala Kangsar, Taiping ; Selangor : Ulu Langat ; Pahang : Kuala Tahan, Senyum and Tongkat ; Negri Sembilan : Bukit Tangga (F.M.S. Mus.). Perak : Sulphur Springs, Grik, and Kuala Lenggong ; Selangor : Ginting Simpah, alt. 2,000 ft. (F.M.S. Agric. Dept.). Perak (Raffles Mus.).

A single male in the above series from Hat Sanuk, S.W. Siam, presumably forms the first record of this species for Siam, as Godfrey has not included it in his list published in 1916. Fruhstorfer says "it is occasionally met with in southern Tenasserim and the Mergui Archipelago as a great rarity."

*E. mazares* ranges from Formosa to the Solomons with the following subspecies in Malaysia :—

<i>E. m. ledereri</i> Feld.	Malay Peninsula.
<i>E. m. eunus</i> de Nicév.	N. E. Sumatra.
<i>E. m. mazarina</i> Fruhst.	West Sumatra.
<i>E. m. mazares</i> Moore	Java.
<i>E. m. baweana</i> Fruhst.	Bawean I.
<i>E. m. natunensis</i> Fruhst.	Natuna Is.
<i>E. m. aristotelis</i> Moore	North Borneo.
<i>E. m. cabeira</i> Fruhst.	S. E. Borneo.

43. *Euploea corus* Fab. *phoebus* Butl.*Euploea corus phoebus* Fruhstorfer 1910, p. 258.*Euploea castelnaui* Distant 1882, p. 24, Tab. II, fig. 6.

*Loc.* Singapore, 2♂♂ (Raffles Mus.).

*Distrib.* *E. phoebus* ranges from Ceylon and Burma eastwards to Palawan and Celebes, with the following subspecies in Malaysia :—

<i>E. c. phoebus</i> Butl.	Malay Peninsula (and Tenasserim).
<i>E. c. hesiodus</i> Fruhst.	Banka I.
<i>E. c. stalius</i> Fruhst.	Sumatra.
<i>E. c. phae ratena</i> Kheil	Nias I.
<i>E. c. micronesia</i> Doh.	Engano I.
<i>E. c. pavettæ</i> Zink.	Java.
<i>E. c. defiguratus</i> Fruhst.	Bali.
<i>E. c. nikrion</i> Fruhst.	Bawean I.
<i>E. c. butleri</i> Moore	Borneo.

The Siamese form is separated as *drucei* Moore. Fruhstorfer states that the hind wing has "a trans-cellular row of violet punctiform spots, which occur also on the



underside." The only Siamese specimen I have seen (a female in Godfrey's collection) has but one small violet dot in the apex of the cell of the hind wing and on the underside only. A Singapore male is the same in this respect, while another has this violet dot on the upperside but not on the underside. The sub-apical spots of the fore wing are rather smaller in *drucei* than in *phoebus*.

#### Subgenus SALPINX, Hübn.

This subgenus is characterized by a patch of light androconial scales on the upperside of the hind wing just below the costa and entering the cell. The different species occurring in the Malay Peninsula may be distinguished thus :—

- a. No white in basal region of hind wing.
- b. Well-defined light blue spot below first median nervule of fore wing; hind wing without double row of marginal spots *leucogonys*.
- b'. No light blue spot, (or if present, barely visible) below first median nervule of fore wing; hind wing with double row of whitish marginal spots.
- c. Fore wing with well-defined white apical spots *singapura*.
- c'. Fore wing without or with faint white apical spots *dejeani*.
- c'. Fore wing with well-defined apical spots and marginal spots at apex *crassa*.
- a'. Basal region of hind wing prominently white *diocletianus*.

#### 44. *Euploea leucostictos* Gmel. *leucogonys* Butl.

*Euploea leucostictos leucogonys* Fruhstorfer 1910, p. 263.

*Euploea vestigiata* Distant 1882, p. 27, Tab. III, figs. 6 & 7.

*Loc.* S.W. Siam : Hat Sanuk and Tasan ; Langkawi Islands ; Kelantan : Kuala Krai ; Perak : Maxwell's Hill ; Pahang : Kuala Lipis ; Selangor : Bukit Kutu (F.M.S. Mus.). Perak : Gunong Kledang, 2,646 ft. ; Selangor-Pahang : Semangko Pass, 2,700 ft. ; Selangor : Bukit Kutu 3,457 ft. ; Negri Sembilan : Gunong Angsi, 2,000–2,700 ft. ; Singapore (Raffles Mus.).

*Distrib.* *E. leucostictos* ranges from India to Formosa, south and east through Malaysia to the Mariannes. The subspecies occurring in the Malaysian subregion are :—

<i>E. l. leucogonys</i> Butl.	Malay Peninsula (Siam and Burma).
<i>E. l. vestigiata</i> Butl.	Sumatra.
<i>E. l. juno</i> Stich.	Nias I.
<i>E. l. phane</i> Doh.	Engano I.
<i>E. l. marea</i> Fruhst.	Batu Is.
<i>E. l. leucostictos</i> Gmel.	Java.
<i>E. l. timaeus</i> Fruhst.	Bawean I.
<i>E. l. relucida</i> Fruhst.	Bali.
<i>E. l. syra</i> Fruhst.	Borneo (and Palawan).

As with so many Danaines, the females appear to be rare. In the F.M.S. Museums series of 63 only 5 are females. In the Raffles Museum there are 31 males to 7

females. Both sexes are very variable both in markings and size. In the Raffles Museum series of 25 males from Bukit Kutu, all taken in April 1915, the expanse of wings varies from 68 to 100 mm.

45. *Euploea aegyptus* Butl. *singapura* Moore.

*Euploea aegyptus singapura* Fruhstorfer 1910, p. 268.

*Euploea aegyptus* Distant 1882, p. 22 (foot-note).

*Loc.* Singapore, 2 ♂♂, 1 ♀ (Raffles Mus.).

Although this species is at once distinguished from the next, *midamus*, by the presence of apical white spots in the fore wing, nevertheless, as Fruhstorfer points out, its relationship to that species must be very close.

Apparently *aegyptus* represents a group of island forms extending as far north as Singapore, but not occurring on the Malay Peninsula proper, while *midamus* is a continental species, with a geographical race known as *E. m. dejeani* extending down the Malay Peninsula as far south as Negri Sembilan, but not so far as Singapore.

The Malaysian subspecies of *E. aegyptus* are :—

<i>E. a. aegyptus</i> Butl.	Borneo.
<i>E. a. singapura</i> Moore	Singapore.
<i>E. a. sophia</i> Moore	Sumatra.
<i>E. a. limyrus</i> Fruhst.	Pulau Tello, Batu Is.
<i>E. a. staudingeri</i> Kheil	Nias I.
<i>E. a. sticheli</i> Hag.	Mentawai Is.
<i>E. a. rafflesi</i> Moore	Java.
<i>E. a. tricolora</i> Fruhst.	Bawean I.
<i>E. a. iduna</i> Fruhst.	Kangean I.

46. *Euploea midamus* Linn. *dejeani* Moore.

*Euploea midamus dejeani* Fruhstorfer 1910, p. 270.

*Euploea dejeani* Distant 1882, p. 29, Tab. IV, fig. 1.

*Euploea chloe* Distant 1882, p. 30, Tab. IV, fig. 2, Tab. II, fig. 5.

*Euploea margarita* Distant 1882, p. 31, Tab. IV, fig. 3.

*Loc.* S.W. Siam : Hat Sanuk and Tasan ; Kedah : Kedah Peak and Gurun ; Selangor : Bukit Kutu ; Tioman Island ; Negri Sembilan : Bukit Tangga (F.M.S. Mus.) ; Perak : Kuala Lenggong (F.M.S. Agric. Dept.). Pahang (Raffles Mus.).

*Distrib.* *E. m. dejeani* is the only form occurring in the Malaysian subregion. Other subspecies occur in Siam, Assam, Nepal and South China.

The F.M.S. Museums series of 8 males and 1 female shows an interesting gradation from the Siamese form with blue gloss on the fore wings and reduced white sub-marginal spots in the hind wing to another from Kedah, still with the blue gloss but with larger white sub-marginal spots in the hind wing, merging finally into examples from further south in which the blue gloss practically disappears altogether.

A male in the Raffles Museum from Pahang goes one step further in showing distinct traces of white apical spots in the fore wing, thus approximating the last form discussed



(*E. a. singapura*), which appears to be confined to Singapore. This Pahang male, however, and a female bearing the same locality label approximate the Siamese form in having the hind-marginal spots on the hind wing much reduced. It is evidently a variable species and it would probably be more correct to make the *aegyptus* group of forms subspecies of *midamus*. Distant's description and figure of *E. chloe* from Province Wellesley, Malacca and Singapore, suggest connecting links between the two. His figure of *margarita* shows pale blue spots on fore wing which I have not seen in Malay Peninsula examples of this species.

47. *Euploea crassa* Butl. *crassa* Butl.

*Euploea klugi crassa* Fruhstorfer 1910, p. 271, fig. 79c.

*Euploea crassa* Fruhstorfer 1911, p. 278.

*Euploea crassa* Distant 1882, p. 29, Tab. V, fig. 8.

Loc. Kedah (Distant).

Distant's single specimen from Kedah appears to be the only record of the species in the Malaysian subregion. The typical form occurs in Siam and Indo-China, with subspecies in India and Ceylon. The elongated pale violet apical spots in the fore wing, practically connected with well-defined whitish spots on the apical half of the hind-margin, render this species easy to distinguish from the other species of this subgenus.

48. *Euploea diocletianus* Fab. *diocletianus* Fab.

*Euploea diocletianus diocletianus* Fruhstorfer 1910, p. 271.

*Euploea diocletianus* Distant 1882, p. 28, Tab. IV, figs. 4 & 5.

A common butterfly throughout the Malay Peninsula.

In a series of 78 males out of 80 specimens from the F.M.S. Museums the only variation to be noticed is in the small white post-cellular spot of the fore wing upper side. This varies in size; is absent altogether in one from Kelantan; in others it is well-formed and triangular in shape, while in a few there is a second spot below it.

*E. diocletianus* is typically a Malaysian butterfly, with the following subspecies recognized in our subregion :—

<i>E. d. diocletianus</i> Fab.	Malay Peninsula, Sumatra (and Siam to Burma and Assam).
<i>E. d. lowi</i> Butl.	Borneo.
<i>E. d. ærithus</i> Fruhst.	Natuna Is.
<i>E. d. alcidice</i> Godt.	Java.
<i>E. d. schreiberi</i> Butl.	Nias I.
<i>E. d. schildi</i> Fruhst.	Batu Is.

One other subspecies occurs in Northern India.

In addition to the foregoing species of this subgenus occurring in the Malay Peninsula the following species are recorded from the Malaysian subregion, although not from the Malay Peninsula :—

49. *Euploea eleusina* Cr. *eleusina* Cr.*Euploea eleusina eleusina* Fruhstorfer 1910, p. 262.*Distrib.* Java, Bawean, Bali and Kangean Islands, with other subspecies outside Malaysia from Sumba and Celebes.50. *Euploea gamelia* Hübn.*Euploea gamelia* Fruhstorfer 1910, p. 268.*Distrib.* West and East Java.

Hitherto only known from the mountains of West Java. Mr. Boden Kloss sends me a female from the F.M.S. Museums collected at Ongop Ongop, 4,800 ft., on the east side of Idjen *massif*, Eastern Java. It does not appear to be separable from the West Javan form.

51. *Euploea martini* de Nicév.*Euploea martini* Fruhstorfer 1910, p. 268, fig.\* 80c.*Distrib.* Sumatra.52. *Euploea simillima* Moore *aelia* Fruhst.*Euploea simillima aelia* Fruhstorfer 1910, p. 269.*Distrib.* North Borneo, with other subspecies outside Malaysia.

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## VI. THE APPLE-SNAILS OF THE MALAY PENINSULA.

BY N. ANNANDALE, D.Sc., F.A.S.B.

Director, Zoological Survey of India.

Mr. Boden Kloss has been kind enough to send me for examination the shells of Ampullariidae in the collection of the Federated Malay States Museums and has asked me to give him some notes upon them for publication. This I gladly do, if only to call attention to our ignorance of the freshwater molluscs of the Malay Peninsula. De Morgan<sup>1</sup> and Moellendorf<sup>2</sup> have published lists and descriptions of the Perak species, Nevill<sup>3</sup> has described and annotated a few Ampullariidae and Viviparidae from Penang and Perak and I have done so for a few species and races of the former family<sup>4</sup> from the Siamese Peninsular Provinces; but the whole of malacological literature must be searched for a few scattered references to the species that occur in the southern parts of the Peninsula.

The collection of Malayan Ampullariidae I have examined is not a large one, but it includes specimens of all the species described from the Peninsula and the Archipelago. The type-specimens of three Peninsular forms are also in my hands, namely *Pachylabra stoliczkana* (Nevill) *P. turbinis subampullacea* (Nevill) and *P. turbinis lacustris*, Annandale. These specimens belong to the collection of the Zoological Survey of India and are preserved in the Indian Museum.

The following forms are known from the Siamese Peninsular Provinces, Penang, "Malacca" and the Federated Malay States; possibly others may occur in Singapore, Johore and other southern districts, but none, so far as I know, have been recorded.<sup>5</sup>

## AMPULLARIIDAE OF THE MALAY PENINSULA.

	(Malay name "Kělēmbuai.")
<i>Pachylabra stoliczkana</i> (Nevill)	Penang; Larut, Perak; Selangor.
<i>Pachylabra conica</i> var. <i>contracta</i>	Assam; Upper Burma; Penang; "Malacca."
<i>Pachylabra gracilis</i> (Lea)	Continental Siam; Tenasserim; Penang; Perak.
<i>Pachylabra perakensis</i> (de Morgan)	Renong; Perak; Selangor.
<i>Pachylabra winkleyi</i> (Pilsbry)	Pegu; Singgora Province in Peninsular Siam.
<i>P. turbinis subampullacea</i> (Nevill)	Singgora Province; Federated Malay States; Penang.
<i>P. turbinis lacustris</i> Annandale	Talé Sap, Singgora Province.

<sup>1</sup> Bull. Soc. Zool. France, X, pp. 353-428 (1885).<sup>2</sup> Proc. Zool. Soc. London, 1891, pp. 330-348.<sup>3</sup> Cat. Moll. Ind. Mus., fasc. E. (1877), and Hand List Moll. Ind. Mus., II (1884), pp. 1-8.<sup>4</sup> Journ. Nat. Hist. Soc. Siam, IV, pp. 1-24 & 45, pls. I, II (1920).<sup>5</sup> Nevill (Hand List Moll. Ind. Mus., II, 1884, p. 5) records two examples under the name of *Ampullaria conica* var. *borneensis* (= *Pachylabra borneensis*) from Singapore. Traill (Journ. Ind. Arch. I, 1847, p. 240) mentions an example of *Ampullaria* from Singapore, C.B.K.



**Pachylabra stoliczkana (Nevill).**

1877. *Ampullaria stoliczkana*, Nevill, Cat. Moll. Ind. Mus., fasc. B. p. 11.  
 1881. *Ampullaria stoliczkana*, id., Journ. As. Soc. Bengal L (2), p. 155, pl. vi, fig. 11.  
 1885. *Ampullaria welleslyensis*, de Morgan, Bull. Soc. Zool. France, X, p. 419, pl. viii, fig. 13.  
 1891. *Ampullaria welleslyensis*, Moellendorf, op. cit., p. 346.  
 1911. *Pachylabra turbinoides*, Kobelt (in part), op. cit., pp. 95-102, pl. xi, figs. 6, 7.  
 1911. *Pachylabra welleslyensis*, id., op. cit., p. 91, pl. xxxix, figs. 5, 6.

Two specimens in the collection received from the Malay States agree closely with the types of Stoliczka's species, which are in the Indian Museum. They also seem to me to agree sufficiently closely with de Morgan's figures of his *A. welleslyensis* from the same locality, allowing for the fact that the figures are based on a specimen in which the apical part of the spire had been completely destroyed. Further they have a close resemblance in outline to two of Kobelt's figures of *P. turbinoides*, namely those cited above, one specimen resembling each figure.

As Stoliczka's original description is difficult of access I quote it *in extenso* :—

"Though I very much doubt if the Penang form can be really distinct from the many described species, still I find it impossible to class it even as a variety of any of the species I know. Its substance, shape of the whorls, etc., distinguish it at a glance from all the forms I have grouped together as *A. conica*. It a good deal resembles Reeve's fig. 37 *A. turbinoides* (Australia) ; it is, however, more oblong, ovate and contracted in shape, with sombre-brown, polished coloration. In these latter respects it closely resembles *A. polita* from which its shape and produced spire easily distinguish it. *A. callistoma*, Morl. (Ser. Conch., Livr. IV, Pt. 13, fig. 7 ; Cambodia), is still closer, though indeed this seems to me to be scarcely more than a small variety of *A. polita*. Reeve's fig. 96 of his *A. javanica* (Java) may perhaps prove to belong to one and the same species ; the typical figure is apparently taken from an immature shell, and it is therefore impossible to decide without actual comparison.

Ovately oblong, with six regularly produced whorls, the last not swollen (or subangulate) above as in *A. polita* and *A. callistoma* ; scarcely umbilicate ; aperture contracted and produced, marked interiorly with faint interrupted bands, slightly effused at base ; epidermis polished, brown.

Long. 54, diam 41, long. : apert. 36, diam. 23.5 mil.

(7) Penang ; coll. Stoliczka. Three full-grown and four young specimens."

Stoliczka's type-series was from Penang, while de Morgan gives the same island and Larut, Perak, as localities for his *A. welleslyensis*. The new specimens are from Selangor.

I think that Nevill was right in treating this form as a variety of *P. conica*, as some individuals might be assigned either to it or to the *forma typica* of that species with almost equal justice. Only the specimens from Bhamo in Nevill's collection can, however, be assigned to it, those from Tenasserim representing *P. gracilis*.

The variety was described from "Malacca." According to Kobelt it occurs in Assam as well as in Upper Burma. The *forma typica* of *P. conica* is widely distributed in Burma and has been found in Northern Siam.

***Pachylabra gracilis* (Lea).**

1920. *Pachylabra gracilis*, Annandale, Journ. Nat. Hist. Soc. Siam, IV (1920), p. 11, pl. i, fig. 4.

The differences between this species and *P. conica* noted in the paper cited appear to be constant in the fairly large series now before me. The internal colouration of the shell also is characteristic (fig. cit.). The largest shell I have seen is 37 mm. high and 31.5 mm. in maximum diameter. The apex is eroded and the shell has the appearance of being adult.

There are specimens in the F.M.S. Museums collection from Penang and the Kinta district, Perak. The species has hitherto been known only from northern Siam, but the shells from Tenasserim labelled *A. conica* var. *compacta* by Nevill certainly belong to it.

***Pachylabra perakensis* (de Morgan).**

1885. *Ampullaria perakensis*, de Morgan, op. cit., p. 418, pl. viii, fig. 12.

The colouration of the shell is evidently variable. De Morgan describes it as, "Caerulea, multis croceis facies ornata," but in the specimens I have examined it is of a bright yellowish olivaceous shade with a few faint darker spiral bands. The shape, high polish of the surface and sculpture of very fine longitudinal costae are, however, characteristic.

De Morgan records the species from the lower Kinta and Plus valleys. There are specimens in the Kuala Lumpur collection from Perak and Selangor and Mr. Boden Kloss recently sent me one from Renong on the Isthmus of Kra on the Siamese side of the Pakehan river.

***Pachylabra turbinis subampullacea* (Nevill).**

1885. *Ampullaria turbinis* var. *subampullacea*, Nevill, Hand. list Moll. Ind. Mus. II, p. 6.

1885. *Ampullaria sumatrensis*, de Morgan (nec Philippi), op. cit. p. 418.

1920. *Pachylabra turbinis* race *subampullacea*, Annandale, op. cit. p. 48, pl. i, fig. 7, pl. ii, fig. 4.



This form, which I have discussed at length in the paper cited, is evidently the common large *Pachylabra* of the Malay States as well as of the Siamese Peninsular province of Singgora. De Morgan records it from Penang and Rhaman as well as from both the upper and the lower Kinta and Plus valleys in Perak. It is not known to range north of the Talé Sap or Inland Sea of Singgora. Several authors have confused it with *P. ampullacea* (Linn.) [*Ampullaria sumatrensis*, Philippi], but Nevill pointed out the differences quite clearly in his "Hand List."

## VII. TWO NEW BATRACHIANS AND A NEW SNAKE FROM BORNEO AND THE MALAY PENINSULA.

By MALCOLM A. SMITH, F.Z.S.

(Plate II.)

I am indebted to the Director of the Federated Malay States Museums, for the opportunity of examining two separate collections of reptiles and batrachians. One of them was made by the native Museum collectors in 1919, upon Mt. Dulit, Sarawak, Borneo; the other, also in the same year, during the expedition of Messrs. Robinson and Kloss to Peninsular Siam. Amongst a large amount of interesting material the following species appear to be new :—

*Rana pullus*, *sp. nov.* (pl. II, fig. 1).

Vomerine teeth in two very oblique series, commencing between the choanae and extending well behind, the distance between them less than their distance from the choanae; tongue without median papilla; head as long as broad, snout rounded or obtusely pointed, feebly projecting beyond the mouth, a little longer than the eye; canthus rostralis obtuse, loreal region oblique, concave; nostril nearer the tip of the snout than the eye; distance between the nostrils equal to or greater than that of the upper eyelid; tympanum very distinct,  $1/2$  to  $3/5$  the diameter of the eye.

Fingers moderately long, first slightly shorter than second; tips with moderately large discs, which are a little broader than long, and with a groove in front separating the upper from the lower surface; subarticular tubercles large and prominent; discs of the toes like those of the fingers; toes half webbed, the web reaching the disc of the fifth toe and penetrating to a quarter between the outer metatarsals; subarticular tubercles moderately prominent; a tarsal fold; inner metatarsal tubercle feebly prominent,  $3/4$  to  $4/5$  the length of the inner toe; no outer tubercle; tibia 2 to  $2\frac{1}{4}$  times in distance from snout to vent, as long as or a little longer than the foot; the heels meet when the limbs are folded at right angles to the body; the tibiotarsal articulation reaches the snout or not quite so far.

Skin with a glandular network of fine folds, the reticulations largest and best marked above.\* A strong glandular fold from the eye to the shoulder.

Dark grey or blackish above, whitish below, thickly speckled, except on the belly, with dark grey. Some of the young have light and dark bars on the hind limbs.

\* The skin of this frog is unusually tender. There is not a single example in the series in which the skin is not torn or damaged in some part of the body. The glandular reticulations referred to are possibly not so prominent in life as in spirit specimens.



This frog does not appear to have any very close ally. Mr. Boulenger, who kindly examined the series with me, placed it near to *Rana beddomii* Gunther, from Southern India.

Males smaller than females, without vocal sacs, and with an enlarged (pale) pad on the first finger.

Eggs large and few, unpigmented, the vitelline sphere measuring 2 mm. in diameter.

Nasals largely in contact with each other; terminal phalanges Y-shaped.

Type series in the British Museum. Type locality, Tasan, 25 miles S.W. of Chumporn, Peninsular Siam.

46 specimens examined, all from the type locality, with one exception from Mamoh, in Renong (No. 4501).

#### Measurements of Type Series in Millimetres

Author's Number	..	3286	3294	3300	4488	4496	3280	3285	3288	3293	3296	4501
Snout to Vent.	..	31	31	31	32	31	37	38	38	40	38	31
HEAD:—												
Length	..	12	12	13	13	12.5	14	14.5	14.5	15	15	14.5
Width	..	12	12	13	14	13	16	17	16	17	16	16
Snout	..	6	6	6	6	6	7	7	7	7	7	7
Eye	..	4.5	4.5	5	6	5.5	6	6	6	6	6	5.5
Interorbital Width	..	3	3	3	3	3	4	4	4	4.5	4	4
Tympanum	..	3	3	3	3	3	2.5	3	2.5	3	2.5	2.5
Arm	..	18	18	20	20	20	24	25	24	26	24	24
Leg	..	50	50	50	53	51	59	59	59	60	62	56
Tibia	..	16	16	17	17	16	18	18	18	19	19	19
Foot	..	16	16	16	16.5	16	18	18	18.5	19	19	19
		♂	♂	♂	♂	♂	♀	♀	♀	♀	♀	♀

#### *Nectophryne picturata*, sp. nov. (pl. II, fig. 2).

Habit slender; head as long as broad; snout rounded, projecting beyond the lower jaw, as long as the orbit; no canthus rostralis; loreal region oblique; interorbital region twice as broad as the upper eyelid; tympanum absent.

Fingers with well developed truncated discs, webbed at the base, first much shorter than second; subarticular tubercles well developed; toes webbed at the base, the discs a little larger than those of the fingers; two flat metatarsal tubercles; no tarsal fold; the tibiotarsal articulation reaches the tip of the snout,

Skin smooth, no parotid gland.

Blackish brown above on the head and body, limbs paler with dark cross bars. Below with large round spots of pale yellow.

A single female specimen from Mount Dulit, Sarawak, N. Borneo, collected at 1,000 metres in August, 1919. Type in the British Museum, author's number, 4,559.

Eggs large and pigmented, the vitelline sphere having diameter of 2 mm.

Allied to *N. maculata* Mocquard.

#### Measurements in Millimetres.

Snout to vent	..	..	22.
Length of head	..	..	7.5.
Snout	..	..	3.
Arm	..	..	14.
Leg	..	..	35.

#### *Tropidonotus baramensis*, *sp. nov.*

Maxillary teeth 21, the last two abruptly enlarged. Head short, not very distinct from neck; eye moderate. Rostral twice as broad as high; nostril large, between two nasals; internasals broader than long, not half as large as the prefrontals; frontal scarcely longer than broad, as long as its distance from the end of the snout; loreal slightly deeper than long; one prae and three postoculars; two large superposed anterior temporals followed by ordinary scales; 8 supra-labials, 4th and 5th touching the eye; 6 infralabials in contact with the anterior chin-shields, which are very broad and shorter than the posterior.

Scales in 19 rows, reducing to 15 before the vent, feebly keeled, those of the outer row smooth; ventrals 134, anal divided, subcaudals 47 pairs.

Greyish olive above with an indistinct blackish network; yellowish below, the fore-part sparingly, the hinder very thickly, powdered with grey; tail with a white line along the outer margin of the subcaudals.

Total length 700 mm., tail, 125.

A single male specimen from Mount Dulit, Sarawak, North Borneo, at 1,000 metres. Type in the British Museum, authors number, 4,579.

Allied to *T. subminiatus* Schlegel, and *T. nigrocinctus* Blyth.







1. *RANA PULLUS*. / 2. *NECTOPHRYNE PICTURATA*, X2.





VIII. SOME WATER-SNAKES NEW TO, OR RARE  
IN, THE MALAY PENINSULA.

By C. BODEN KLOSS, F.Z.S.

The following rare water-snake of the sub-family *Homalopsinae* is new to the fauna of the Malay Peninsula : it was obtained by a native collector at the mouth of the Kurau River at the northern extremity of the coast of Perak in January 1917.

1. *Gerardia prevostiana*.

*Coluber (Homalopsis) prevostianus* Eyd. & Gerv. in Guér. Mag. Zool. cl. III, 1837, p. 5, pl. XV.

*Gerardia prevostiana* Boulenger, Fauna Brit. India, Rept. p. 379 (1890), id., Cat. Snakes Brit. Mus. III, p. 20 (1896).

The single specimen obtained agrees with Boulenger's descriptions (*l.c.s.*) except that the temporals are 2 + 2 and there are three praefrontals, the median one being smaller than the others and broadest in front.

Snout to vent 305 mm., tail 45 mm.

Hitherto apparently only known from Burma, India and Ceylon.

2. *Fordonia leucobalia*.

*Homalopsis leucobalia* Schleg. Phys. Serp. II, 1837, p. 345, pl. XIII, figs. 8, 9.

*Fordonia leucobalia* Boulenger, Vert. Fauna Malay Pen., Rept. & Batr. 1912, p. 164.

The collector secured on the same occasion one example of the variety named *F. unicolor* by Gray. Snout to vent 350 mm. ; tail 50 mm.

This species ranges from Bengal to Cochin-China and North Australia. It has been taken at Singapore and at Penang, where Cantor says it is common, but the present specimen is the first we have met with.

3. *Herpeton tentaculatum*.

*Erpeton tentaculatus* Lacép., Bull. Sci. Soc. Philom. II, 1800, p. 169 ; id., Ann. Mus. II, 1803, p. 280, pl. 1

*Herpeton tentaculatum* Boulenger, Cat. Snakes Brit. Mus. III, 1896, p. 25 ; Annandale, Journ. Nat. Hist. Soc. Siam II, 1916, p. 91.

First recorded from the Malay Peninsula by Dr. N. Annandale (*l.c.s.*) who obtained it in the Talé Sap or Inland Sea, Singgora.



This curious snake is easily identified by means of the rostral appendages which occur on either side of the snout : for an account of these see Smith. Journ. Nat. Hist. Soc. Siam, I, 1914, p. 109 and plate.

To include these the "Synopsis of the Genera" in Mr. Boulenger's volume of Reptilia and Batrachia of the Vertebrate Fauna of the Malay Peninsula (p. 158) may be altered as follows :—

No tentacles on the upper lip

- II. Loreal present ; parietals well developed ;  
     ventrals large, not keeled  
     Scales in 19 rows, nasals semidivided ... *Cantoria*  
     Scales in 17 rows, navals undivided .... *Gerardia*

With tentacles on the upper lip

(a single species only) ... .. *Herpeton*

## IX. NINE NEW ORIENTAL BIRDS.

BY H. C. ROBINSON AND C. BODEN KLOSS.

1. *Treron bisincta praetermissa* subsp. nov.

Larger than *T. b. bisincta* (Jerdon) from Madras (wing 144) : differs from *T. b. domvillii* (Swinh.) from Hainan in having the grey nuchal patch in the female clear and more extensive whereas, fide Hartert, it is indistinct and small in the island bird (Nov. Zool. XVII, 1910, p. 193).

Hartert has inadvertently described the Ceylon birds as being smaller than Madras individuals (*l.c.s.*) though his specimens are exactly the same size as typical birds, and *leggei* is therefore synonymous with *b. bisincta*. Swinhoe states that *domvillii* is smaller than the typical form (presumably the bird now described), but this is denied by Hartert.

The range of this race is probably from Bengal and Assam southward to the Malay States, and in the north, eastwards to China where the wing averages 156 mm. (fide Baker, India Pigeons and Doves (1913) p. 51).

*Types.* Adult male and female from Koh Lak, South-West Siam. Collected by H. C. Robinson and C. Boden Kloss on 5th April, 1919. Collector's Nos. 5075, 5074.

Wings 162, 161 mm.

*Specimens examined.* Thirteen from the Malay Peninsula. Wings 157-163 mm.

Birds from East and South-East Siam and Java (apparently first met with in the island by Kloss early in 1920) are smaller, the wing being always under 150 mm. and these may represent another race. We expect to settle the point shortly.

2. *Macropygia emiliana borneensis*, subsp. nov.

Differs from the typical race from Java (typical locality here specified as the plains of Central Java) in having the head and nape distinctly darker, the breast more amythstine, the centre of the abdomen paler, tending towards buff. Wing of type, 163 mm.

*Type.* Adult male collected at Lingit, Saribas, Sarawak, Western Borneo, by Native Collector in March, 1917.

*Series examined.* Five adult males and two females, all from Sarawak, compared with a large series of Javan birds from all parts of the island. Specimens from Java, attain a greater length of wing than any of our Bornean birds (one male, 180 mm.).

3. *Zanclostomus javanicus pallidus* subsp. nov.

Differs from *Z. j. javanicus* (Horsf.) of Java as being paler below : the rufous area less intense and the grey paler and more washed with buff.



*Type.* Adult male from Kedah Peak, Malay Peninsula, 2,500–3,500 ft. Collected by H. C. Robinson and C. Boden Kloss, 4th December, 1915.

Twelve specimens from Bandon to Negri Sembilan compared with fourteen from various parts of Java. A Sumatran and a Bornean example do not appear to differ from Malayan birds.

We believe that all the names which have been referred to this species apply to the Javanese form: *javanicus*, of course; but also *Coccyzus rubrirostris* Drap., *Piaya erythrorhyncha* Less. and *P. chrysogaster* Less. *P. erythrorhyncha* was stated to come from Java and, if so, the description will only fit this bird: *P. chrysogaster* seems to be the same thing though recorded as from Guiana and we attach the name to the Javan form rather than to the other as the forehead is stated to be rusty yellow, the breast slate coloured and the abdominal region, etc., chocolate red. As a matter of fact the forehead of *javanicus* is not red; but that colour extends upwards in front of the eyes to a much greater extent than in the race now described.

#### 4. *Brachylophus puniceus continentis* subsp. nov.

The typical race of this woodpecker from Java *B. p. puniceus* (Horsf.) is very distinct, the earcoverts being darker green and the back and rump entirely lacking any tinge or fleckings of golden yellow.

Hartert (Nov. Zool. III, 1896, p. 542) separated the birds of the Malay Peninsula, Borneo and Sumatra (type-locality) on these grounds and named them *Gecinus puniceus observandus*.

Seven Sumatran birds before us (wing 115–123) are distinctly smaller than our series from the Peninsula. For the present we content ourselves with naming the Malayan race as above.

Larger than *B. p. observandus* from Sumatra. Wing of type 132 mm.

*Type.* Adult male collected at Tapli, Pakchan Estuary, Renong, North Malay Peninsula by H. C. Robinson and C. Boden Kloss on 3rd March 1919. Collector's No. 4382.

*Specimens examined.* Seventeen from Chumporn to Negri Sembilan. Wings 123–136 mm.

Six Bornean birds have the wings 118–126 mm. and seem to average about the same size as the Sumatran form with which we leave them.

#### 5. *Eupetes macrocerus borneensis* subsp. nov.

Like *E. m. macrocerus* Temm. of Padang, Sumatra, and of the Malay Peninsula (*E. m. griseiventris* Baker) but rather more deeply and richly coloured.

Compared with a topotype from West Sumatra and six adults from the Malay Peninsula,

*Type.* Adult male from Samarahan, South Sarawak, obtained on 25th. November 1919 by F.M.S. Museums' Collector.

*Specimens examined.* The type, five from the Baram district and one from Penrisen, Sarawak, Borneo.

Measurements of the type : length, 270 ; wing 93 ; tail 122 ; tarsus 41 ; bill from gape 33 mm.

6. *Drymocapthus tickelli australis*, subsp. nov.

Southern birds from Bandon to the southern limit of the species in Selangor, where it is strictly a montane bird, are decidedly richer coloured both above and below than typical ones.

*Types.* Adult male and female from Ginting Bidei, Selangor 2,300 ft., 5th and 16th April, 1917, collected by C. Boden Kloss.

"Iris crimson, maxilla brown, mandible yellowish fleshy, feet fleshy."

Wing ♂ 66 : ♀ 64 mm.

*Specimens examined.* Twenty-seven from Bandon, Trang, Perak and Selangor.

7. *Malacocincla sepiaria barussana*, subsp. nov.

*Type.* Adult female, Siolak Dras, Korinchi, West Sumatra, 3,000 ft., collected on 18th March, 1914, by H. C. Robinson and C. Boden Kloss.

Differs from the Javan forms of *M. sepiaria* in darker colouration ; back reddish russet, tail more rufous chestnut, foreneck greyer, breast and abdomen darker suffused with russet ; white centre to the abdomen reduced. Crown dark as in *M. s. minor* (Meyer) of E. Java.

From the Malayan form *M. o. tardinata*, Hartert, it differs in having a distinctly dark cap and deeper colour throughout.

*Specimens examined.* Fourteen from various localities in West Sumatra, compared with seven from East and Mid-Java and thirteen from the Malay Peninsula.

8. *Horizillas rufifrons indochinensis*, subsp. nov.

*Setaria rufifrons* Robinson, Ibis 1915, p. 748 (S.E. Siam).

*Setaria leptocephala* Kloss, Ibis 1918, p. 203 (E. & S.E. Siam) ; id., Journ. Nat. Hist. Soc. Siam, III, 1919, p. 150, Robinson and Kloss, Ibis 1919, p. 582 (Cochin China).

Differs from *H. rufifrons* inhabiting Java in having the feathers of the forehead and crown more strongly black-tipped and the nape darker ; paler above ; tail browner, rather less brightly rufous, the lowest upper tailcoverts distinctly less so. Size apparently rather smaller (15 Javanese birds, wings 69-81 : 20 Indochinese, 67-75 mm.).

*Types.* Adult male and female from Trangbom, Cochin China, collected on 4th June and 31st May by C. Boden Kloss.



T. L. 152, 160 ; Tail, 67, 71 ; Wing, 71, 76 ; Tarsus ; 19.5, 21 ; B.f.g. 17.5, 19 mm.

*Setaria rufifrons* was described by Cabanis as from Sumatra or Java. Büttikofer has deliberately attached *leptodocephala*, Gray, to Javanese birds and they will have to bear that name if different from Sumatran examples : but Sharpe, after inspecting specimens in Leyden stated that the differences he noted in the "Catalogue" did not exist.

As several Javanese birds have wings of 79 to 81 mm. Finsch's statement that the wing of the type of *rufifrons* measures 80 mm. (3 inches of Cabanis) is confirmed.

This is one of the species which, though occurring in Indo-China and the Sunda Islands, is not found in the Malay Peninsula.

(*Horizillas* Oberholser, replaces *Malacopteron* Eyton and *Setaria* Blyth : vide, Smithsonian Miscellaneous Collections, 48, 1905, p. 64).

9. *Prionochilus maculatus septentrionalis* subsp. nov.

*Male*. Differs from the form inhabiting the southern part of the Malay Peninsula (20 specimens from the Malay States compared) in having the ear-coverts much greyer, hardly if at all washed with green ; the white throat stripe narrower and the yellow of the underparts considerably brighter, becoming almost orange chrome on the middle of the breast.

*Female*. Differs in a similar manner from the female of the southern race.

Iris red or reddish ; maxilla black, mandible slate, the tip sometimes black ; feet dark slate or slaty black.

Ten specimens examined from the Northern Malay Peninsula (Lat. 10°-11° N.).

*Types*. ♂ ad. Tasan, Chumporn, 13th March, 1919. H. C. Robinson and C. Boden Kloss, No. 4548, ♀ ad. Tapli, Pakchan Estuary, Renong, 3rd March, 1919. H. C. Robinson and C. Boden Kloss, No. 4393.

## X. NEW AND KNOWN ORIENTAL BIRDS.

BY C. BODEN KLOSS, M.B.O.U., C.F.A.O.U.

ON THE PROPER NAME OF THE BLACK DRONGO WITH  
DESCRIPTIONS OF TWO NEW SUBSPECIES.

The name by which the Black Drongo has hitherto been known specifically, *Dicrurus atra* (*Muscicapa atra* Hermann, Obs. Zool. 1804, p. 208 : Tranquebaria, S. India) is preoccupied by *Muscicapa atra* Gmelin (Syst. Nat. ed. 13, 1, 1788, p. 946) and *Dicrurus macrocerus* Vieillot, must replace it.

All the following are based on "Le Drongolon" of Levaillant (Ois. d'Afr., iii, 1802, pl. 174) so all belong to the same bird : but *macrocerus* has priority :—

*Dicrurus macrocerus* Vieillot, 1817*Muscicapa biloba* Lichtenstein, 1823*Dicrurus indicus* Stephens, 1826*Dicrurus longus* Bonaparte, 1852

"Ind. Orient"

"India"

"Java"

Levaillant, however, recorded no locality for "Le Drongolon," nor did Vieillot for *macrocerus* ; and we have, therefore, to look for a "terra typica" among the others.

The "Ind. Orient" of Lichtenstein is too vague to supply the need as it merely means the East Indies of Asia as distinguished from the West Indies of America and there are several races of Black Drongo.

But Stephens' *Dicrurus indicus*, "India" is quite definite and must therefore be accepted as the typical locality for "Le Drongolon" and, therefore, for the first Linnean name, *macrocerus*, applied to it which, by the subsequent description of the northern Indian form as *albirictus* by Hodgson in 1837, becomes by elimination the name of the Peninsular Indian subspecies.

Bonaparte's citation of Bengal for *macrocerus* (Consp. Av. I, 1850, p. 351) confirms this selection and his attribution of Java to *longus* (t.c.p. 352) and Walden's of the same place to *macrocerus* (Journ. Asiat. Soc. Bengal, 1875, pt. 2, Extra No., p. 129), though he says quite rightly that both these are the same bird, come too late ; while the reference of *biloba* to Java by Cabanis (Mus. Hein I, 1850-1, p. 111) cannot be accepted.

Thus are ruled out for further use all names based on "Le Drongolon."

The races of the Black Drongo, *Dicrurus macrocerus*, therefore are :—

1. *Dicrurus macrocerus macrocerus* Vieill. (syn. *biloba*, *indicus* and *longus*), Nouv. Dict. IX, 1817, p. 588 : Peninsular India.
2. *Dicrurus m. albirictus* (Hodgs.), Ind. Rev. 1837, p. 326 : Nepal
3. *Dicrurus m. minor* Blyth, Layard. Ann. & Mag. Nat. Hist. (2), XIII, 1851, p. 129 : Ceylon.
4. *Dicrurus m. calthoecus* Swinh. (syn. *siamensis* Kloss), P.Z.S. 1871, p. 377 : Southeast China.
5. *Dicrurus m. harteiti* Baker, Nov. Zool. XXV, 1918, p. 299 : Formosa.
6. *Dicrurus m. thai* Kloss : Siam (postea).
7. *Dicrurus m. javanus* Kloss : Java (postea).

*Java. 1818*



**Dicrurus macrocercus thai** subsp. nov.

Like *D. m. macrocercus* of Peninsular India but with the wing shorter and the white rectal spot rarely present instead of rarely absent (present once in ten only : whereas in *D. m. macrocercus* it is absent once in ten according to Baker in Nov. Zool. XXV ; 1918, p. 277).

Differs from *D. m. cathoeca* in having a shorter bill and wing while the median feathers of the tail are always shorter but the outermost generally longer.

Specimens examined. Twenty from S. Tenasserim, S.W. and Central Siam and South Annam. Wing 123-140 ; Tail, outermost feathers, 150-178, median feathers, 100-108; bill from gape 23-25.

Type. Adult male, No. 4975. Collected at Koh Lak, S.W. Siam, 3rd April 1919, by H. C. Robinson and C. Boden Kloss.

"Iris dark brownish red, bill and feet black."

Total length 296 ; wing 135 ; tail 177-105 ; bill from gape 25 mm.

**Dicrurus macrocercus javanus** subsp. nov.

Like *D. m. thai* but with a larger bill (practically equal in size to that of *D. m. cathoeca*).

Specimens examined. Twelve from East Java and Mid-Java. Wing 129-139 ; tail, outermost feathers, 147-166, median feathers, 101-114 ; bill from gape, 24-27.

Type. Adult male No. 5953. Collected at Badjoelmati, Besoeki, E. Java, 3rd February 1920, by C. Boden Kloss.

"Iris dark, bill and feet black."

Total length 296 ; wing 139 ; tail 157 ; bill from gape 26 mm.

ON THE RUBY-CHEEK WITH DESCRIPTIONS OF  
THREE NEW SUBSPECIES.

Having assembled a large series of *Chalcoparia singalensis* from Indo-China and Malaysia I take the opportunity to review the races occurring on the mainland and the large islands.

Beginning with the northern specimens of the series I recognise the following forms :—

1. *Chalcoparia singalensis koratensis* Kloss.

Kloss, Ibis 1918, p. 218 (Korat, E. Siam).

Males with the rufous of the foreneck not extending so far downwards as in other races and terminating abruptly on the upper breast. Remaining lower parts a markedly brighter, less greenish yellow.

Females with lower parts brighter than in the typical race *C. s. singalensis*.

Specimens examined from North Siam, East Siam (topotypes), South-East Siam, South Annam (14 ♂, 9 ♀).

2. ***Chalcoparia singalensis interposita*** Robinson and Kloss, subsp. nov.

Males with rufous of foreneck extending over the upper breast and ending gradually. Remaining lower parts not so brightly yellow as in *C. s. koratensis* but less greenish than in *C. s. singalensis*.

Females like *C. s. koratensis*.

Specimens examined from Bangkok, Siam, south through the North Malay Peninsula to lat. 6° 30' N. (11 ♂, 7 ♀).

*Types.* Adult male from Takuapa, West Coast Peninsular Siam. Collected by H. C. Robinson and C. Boden Kloss on 18th February, 1919. Adult female from Ban Kok Klap, Nakon Sri Tamarat. Collected by H. C. Robinson and E. Seimund on 30th June, 1913.

3. ***Chalcoparia singalensis singalensis*** (Gmelin).

*Molacilla singalensis* Gmelin Syst. Nat. I, 1789, p. 964 (Malacca : Oberholser det.).

Males with rufous of foreneck and upper breast as in *C. s. interposita* but with remaining lower parts a rather greener yellow.

Females with the breast and abdomen distinctly greener than in *koratensis* and *interposita*.

Specimens examined from Perak to Johore, South Malay Peninsula (12 ♂, 9 ♀).

4. ***Chalcoparia singalensis sumatrana*** Kloss, subsp. nov.

Males with the rufous of the foreneck and breast extending still further down towards the abdomen and the latter more tinged with green than in *C. s. singalensis*.

Females rather more greenish below than in *C. s. singalensis*.

Specimens examined from the Ophir to Bencoolen districts, Western Sumatra ; and Deli, North Eastern Sumatra. (9 ♂, 5 ♀).

*Types.* Adult male from Mt. Talamau, 400 metres, and female from Tanangtalu, 1,000 metres, Ophir district, Central Sumatra. Collected by E. Jacobson on 27th April, 1917 and 10th May, 1915. Collector's numbers 891 and 4,553.

5. ***Chalcoparia singalensis borneana*** Kloss, subsp. nov.

As in *C. s. interposita* but rufous of the foreneck and upper breast rather deeper in both sexes.

Specimens examined from various part of Sarawak. (19 ♂, 14 ♀).

*Types.* Adult male from Bukar, Samarahan, Sarawak, obtained by F.M.S. Museums collector on 26th October,



1919; and adult female from Kuching, Sarawak, obtained on 24th May, 1892 (ex Sarawak Museum).

6. *Chalcoparia singalensis phoenicotis* (Temminck).

*Nectarinia phoenicotis* Temminck, Pl. Col. 1824, No. 108, fig. 1 (♂);  
No. 388 fig. 2 (♀) (Java).

Males as in *C. s. singalensis* but rufous of the foreneck and upper breast deeper: abdomens less bright than in *C. s. borneana*.

Females with the rufous of the foreneck much deeper than in the females of any other race (as deep as in the males); not extending on to the upper breast and ending abruptly as in males of *C. s. koratensis*; but still more restricted. Lower breast and abdomen bright as in *koratensis* and *interposita*.

Specimens examined from East, Mid and West Java (7♂, 3♀).

*Chalcoparia singalensis panopsis* Oberholser (Smiths. Misc. Coll. 60, 1912, p. 21) of Nias Id., West Sumatra, is described as having the females with the posterior lower parts more brightly yellowish than in *C. s. singalensis*. It must, therefore, be quite distinct from the adjacent race *C. s. sumatrana*.

Of the males *C. s. koratensis*, of the females *C. s. phoenicotis* is the most distinct.

When I stated, Ibis 1918, p. 218, that birds from the Malay Peninsula, Sumatra and Java were alike my material was inadequate, consisting from the latter places of one Sumatran male only and four old mounted males of faded colours from Java. *C. s. phoenicotis* is a very distinct form on account of the characters of the female: *C. s. sumatrana* less so; but sufficiently distinguished to need separation.

A NEW RACE OF SHAMA FROM JAVA.

*Kittacincla malabarica javana* subsp. nov.

Sexes alike in colour and paler below than the males of *K. m. tricolor* (Vieillot). Typical locality Bantam, W. Java: Robinson and Kloss det.<sup>1</sup>) and with white, not rusty thighs: like the males of *K. m. omissa* Hartert (Nov. Zool. IX, 1902, p. 572. Lawang, E. Java) but without the indistinct white border to the black breast.

Types. Adult male (No. 6277) and female (6112) collected by C. Boden Kloss, 23rd and 18th February 1920,

<sup>1</sup> Extract from M.S. "We consider that Vieillot's citation of the locality of his *Turdus tricolor* (Nouv. Dict. Hist. Nat. XXX, 1818, p. 291) "les isles de la mer du sud" is at least as precise as Hartert's subsequent fixation as "India" (Nov. Zool. IX, 1902, p. 571). Further the description by Scopoli in 1786 (Del Flor. Faun. Insubr., II, p. 97) of the Malabar bird as *Muscicapa malabarica* should prevent "India" being selected for a typical locality. We have, therefore, further fixed the typical locality of *Turdus tricolor* as Western Java." H. G. Robinson and C. Boden Kloss.

at Karangbolang, South Coast of Mid-Java (not Karangbolang of Noesa Kambangan Id.).

Specimens examined. Three males and one female from the type locality : compared with two males and one female from Pandeglang District, N. Bantam ; one male and one female from Wynkoop's Bay, S.W. Coast of Java ; and with two males and one female of *K. m. omissa* from Badjoelmati, E. Coast of Java.

A second male from Wynkoops Bay is intermediate between *tricolor* and *javana* ; a little lighter below than the first, somewhat darker than the latter with white thighs slightly washed with rusty.

Hartert states (l.c.s.) that the female of *omissa* is exactly like the male in colouration but my specimen is distinctly paler below—almost as pale as females of West Javan *tricolor*. The female of *javana*, being like the males, is darker than either of the others.

Measurements of *K. m. tricolor* from Pandeglang<sup>1</sup> and Wynkoops Bay.

T. L. ♂ 277\*, 273, 245 ; ♀ 242\*, 210. Tail, 163\*, 175, 145 ; ♀ 126\*, 105. Wing, ♂ 96\*, 97, 94 ; ♀ 90\*, 85. Tarsus, 26\*, 26, 28 ; ♀ 25, 24. Bill from gape, 24\*, 24, 23.5 ; ♀ 22\*, 22.

*K. m. tricolor* > *javana* from Wynkoops Bay.

T. L. ♂ 261. Tail, 142. Wing, 97. Tarsus, 27. B.f.g. 24.

*K. m. javana* from Karangbolang.

T. L. ♂ 251†, 255, 258 ; ♀ 206†. Tail, ♂ 139†, 142, 138 ; ♀ 102†. Wing, ♂ 93†, 89, 92 ; ♀ 86†. Tarsus, 25†, 27, 26 ; ♀ 25†. B.f.g. 23†, 23, 24 ; ♀ 23†.

*K. m. omissa* from Badjoelmati.

T. L. ♂ 257, 245 ; ♀ 195. Tail, ♂ 144, 130 ; ♀ 91. Wing, ♂ 92.5, 90 ; ♀ 81. Tarsus, ♂ 25.5, 27.5 ; 24 ; ♀ 20. B.f.g. 21, 23 ; ♀ 20 mm.

All collected and measured in the flesh by myself between February and April 1919.

\* Neo-types.

† Types.

#### NEW AND OTHER BIRDS FROM N.E. SUMATRA.

Amongst a small collection of birds from Deli, N.E. Sumatra, and the Karo lands sent me for determination by Jonkheer F. C. van Heurn the following are of interest :—

#### *Spizaetus alboniger* Blyth.

*Spizaetus alboniger* de Beaufort, in "Versl. en Med. der Nederl. Ornith. Vereen" No. 6 (September 1909) Mid Sumatra

1 ♀ Bandar Baroe, Upper Deli, 30.7.20. Wing 365. A fine adult example.

<sup>1</sup> A male has a large irregular white patch covering the side of the throat and the foreneck.



**Hemicercus concretus coccometopus** Reichenb.

2 ♂ from Simpang Toba, Asahan, 10.5.20, and Batang Koeis, Deli, 16.6.20. Wings 83, 84 mm.

**Cyornis elegans** Temm., subsp.?

1 ♀ from Soengei Tassik, Langkat, 8.7.20. Wing 72 mm.

Since I returned Jonkheer van Heurn's collection I have received Dr. Oberholser's description of *Cyornis elegans rupalensis* (Proc. Biol. Soc. Washington, 33, 1920, p. 87) from Rupal Strait, about 250 miles down coast from Langkat. This is stated to be like *C. e. elegans* from Northern and Western Sumatra, but much darker above and on the throat, breast darker, posterior lower parts more ochraceous. The bird from Langkat (Lat. 4° N.) belongs to the typical race.

**Eupetes macrocerus macrocerus** Temm.

1 ♂ Soengai Tassik, Langkat, 30.6.20. Wing 97.

Not differing in any way from specimens in a Malayan series.

Apparantly a new record for Sumatra :—

**Hemichelidon sibirica fuliginosa.**

1 ♂ Karolanden, 1,000 metres, 8.11.19. Wing 78 mm.

New subspecies :—

1. **Pitta granatina vanheurni** subsp. nov.

*Pitta granatina* de Beaufort and de Bussy, Bijdr. tot de Dierk. Atl. XXI, 1918 (?), p. 259 (N.E. Sumatra); Senouckaert, Club van Nederl. Vogelk. Jaarb. No. 10, 1920, p. 115 (N.E. Sumatra).

Like *Pitta granatina coccinea* Eyton, of the Malay Peninsula but developing a markedly larger bill. The large bill and the narrower black frontal area in addition still more clearly distinguish it from *P. g. granatina* Temm. of Western Borneo.

Wing 89, tail 37, tarsus 40, bill from gape 30, from anterior edge of nostril 18 mm.

*Type.* Adult male from Soengai Tassik, Langkat, N.E. Sumatra. Collected by Jonkheer F. C. van Heurn on 7th July, 1920. Compared with 25 examples of *P. g. coccinea* and 25 of *P. g. granatina*.

Jonkheer van Heurn has also sent a second male from Alas Teurba near Lho Seumaweh, Aceh (13th September, 1920); but it is an immature bird with red tips to many of the breast feathers: wing 95; tail 43; tarsus 38; bill from gape 27, from anterior edge of nostril 14 mm.

2. **Thringorhina striolata umbrosa** subsp. nov.

More russet and much darker above than *T. s. striolata* (S. Müller) from West Sumatra south of Padang (18

specimens examined) : crown, nape, back (except the lower rump which is russet), wings and tail being much more strongly washed with black.

Three specimen examined, all from the same locality.

*Type.* Adult male from Bandar Baroe, Upper Deli, N.E. Sumatra, 800 metres. Collected by Jonkheer F. C. van Heurn on 21st August 1920.

Wing 67\*, 65, 65 ; tail 60\*, 60, 62 ; tarsus 23\*, 24, 23 ; bill from gape 21\*, 21, 20 mm.

The type locality of Müller's *Timalia striolata* may be taken as the Padang Residencies, Central West Sumatra.

\* Type.



## XI. NOTES ON SOME ORIENTAL BIRDS.

By C. BODEN KLOSS, M.B.O.U., C.F.A.O.U.

## HALCYON (SAUROPATIS) CHLORIS.

Either together or separately Mr. H. C. Robinson and I have hitherto not seen our way to accept all the races of Malaysian Blue-and-white Kingfishers that Dr. H. C. Oberholser recognises and proposes (Proc. U. S. Nat. Mus. 55, 1919, pp. 351-395). But now with about 80 specimens from Bangkok, south through the Malay Peninsula to Johore; 8 from North-east Sumatra; 16 from Benkoolen, the Padang districts and Korinchi, West Sumatra (*C. cyanescens* Oberh.); and 18 from all parts of Java (*C. palmeri* Oberh.) I have to revise my opinions somewhat.<sup>1</sup>

I cannot perceive all the differential characters Oberholser gives in his key and diagnoses: however, in the large series of continental birds I find a few males—a distinct minority—that are a deeper, less greenish, blue than the others and these make the series as a whole look more blue; as stated, there is frequently a pronounced wash of buff on the flanks which the others lack: the continental birds are certainly smaller: and so are eight specimens from the Deli district of North-east Sumatra, which on this account I should rank with them, though Oberholser says that East Sumatran birds as far north as Deli are *cyanescens*. The wings of my continental birds range from 97 to 106 mm.; those of the Deli examples from 96 to 104 mm.; and those of the West Sumatra specimens from 104 to 112 mm.

Oberholser considers that birds from the Sunderbunds to Singapore are all *armstrongi* (type, a Siamese skin of Gould's collection), and that birds called *humii* by Sharpe (type, a Selangor bird of Hume's collection) are inseparable: but I find, on the contrary, that the great majority of birds from the Malay Peninsula have the earcoverts more blackish, or of a darker different blue, than the birds of the Inner Gulf of Siam which have the earcoverts of the same blue as the crown though sometimes a trifle darker in tint; and on this ground, and because of a deeper buffy wash on the flanks and of a pronounced black nuchal band in most of the specimens (obsolete or absent in the Siamese birds) *humii* may be maintained for birds of the Peninsula, south of the Isthmus of Kra and for those of North-east Sumatra. There seems to be no difference in size: the wings of the 24 more Northern birds (*armstrongi*) range from 98 to 106 mm.; those of the Peninsular series from 97 to 106 mm. and those of the Sumatran set of *humii* from 96 to 104 mm.

*Sauropatis chloris cyanescens* Oberh. (op. cit. 52, 1917, p. 189: type from Pulau Taya, Southern China Sea, north

<sup>1</sup> I am indebted to Mr. W. J. F. Williamson, C.M.G., for the loan of 24 examples from the head of the Gulf of Siam; to Heer E. Jacobson for a dozen from West Sumatra and to Heer. A. C. F. A. van Heyst for examples from North-east Sumatra.

of Banka Id.) is defined as from Sumatra to Borneo and the islands along its east coast with all the intervening islands; also Bawean and various islets in the Java Sea. Placed with this race must be a pair from Pulau Mapur, the easternmost island in the Rhio Archipelago south of Singapore, (wings 110 mm.).

Apart from colour differences which I cannot find, *S. c. palmeri* Oberh. (tom. cit. p. 368 : type from Mt. Salak, W. Java : supposed to be confined to Java), is said to be distinguished from *cyanescens* by a slightly smaller bill : the measurements given for the exposed culmen<sup>1</sup> are :—*cyanescens* (75 examples) 41.5–47.3\*–53.5 mm. ; *palmeri* (25 specimens) 42.5–45.9\*–50 mm. [*i.e.*, within the range of *cyanescens*]. The bills from gape of my West Mid-Sumatran specimens of *cyanescens* measure :—52–56.4\*–60 mm. ; of my Javan birds 55–57.2\*–60 mm. : the converse of Oberholser's findings.

Averages seem to be untrustworthy as they differ with different series : both series attain similar maxima and the smaller-billed Sumatran birds *may* be immature though they have no appearance of this. I cannot separate the Javan birds before me from *cyanescens* : my series of the former has a wing range of 103–116, and the latter 104–112 mm.

#### HALCYON (ENTOMOTHERA) COROMANDA.

Dr. Oberholser has also reviewed the races of the Ruddy Kingfisher, *Halcyon (Entomothera) coromanda* (op. cit. 48, 1915, pp. 639–657) and of Malaysian races which he recognises, we have material of the following :—

##### 1. *Halcyon coromanda coromanda* (Lath.).

Southern continental birds are all considered to belong to this subspecies, which occupies Indo-China and the Malay Peninsula, south to Malacca : Rangoon is selected for the type locality.

This is the largest of the Malaysian forms and the palest both above and below, being not, or comparatively little, washed with magenta on the breast [and on the upper surface, especially the head]. The wing length ranges from 111 to 119 mm. [Nine practically adult specimens examined by Oberholser, five from India, one from China, three from the Malay Peninsula].

<sup>1</sup> I do not like this measurement : the posterior point is not fixed as the forward spread of the frontal feathers, it is very variable. For instance, in two birds which have the same length of bill from the gape and from the anterior edge of the nostril, there is a difference of 3 mm. in the length of the exposed culmen. Both of the lengths mentioned, which are between fixed points, are preferable.

\* Average.



## 2. *Halcyon coromanda minor* (Temm. & Schl.).

This is recognised as inhabiting Borneo with various coastal islands, and also Singapore. Pontianak is selected as the typical locality.

It is a darker bird, particularly below [and also much more washed with magenta on head and upper parts generally]: it is also smaller, the wings ranging from 99 to 104 mm. [Five adult specimens examined by Oberholser, three from Borneo, two from Singapore].

We have no examples of West Sumatran birds which are named by Oberholser *coromanda neophora* (type locality, Tapanuli Bay, Western Sumatra, opposite Nias Id.): they are characterised as being like *c. coromanda*, but smaller; lower parts darker and breast more washed with magenta, wings 100–111 mm. [Five practically adult specimens examined by Oberholser, two only from Western Sumatra]. The habitat is given as Sumatra; and probably Banka Id. This race appears on the characters given to be very like *minor*, but a little larger [and perhaps paler above]: but Oberholser's material was small in both cases.

It has already been pointed out<sup>1</sup> that all Sumatran birds are not *neophora*; four examples from Deli in the North-east of Sumatra being undoubtedly *c. coromanda*, (though Oberholser regards his only specimen from N. E. Sumatra, a juvenile female from Aru Bay, a little to the north of Deli, as *neophora*). This is not surprising as birds taken on Pulau Jarak, the Aroa Islands and the One-fathom Bank Lighthouse in the Straits of Malacca are *c. coromanda* and it is highly improbable that they were resident on any of these places.

Thus the range of *c. coromanda* must be extended to North-east Sumatra.

To the distribution area of *minor* must be added Johore, birds from the south of that State being indistinguishable from those of Singapore Island adjacent.<sup>2</sup>

The wing measurements of our specimens are:—

### *H. c. coromanda*:—

Malay Peninsula, Langkawi and Terutau Ids. (8 spms.)	..	..	105—116 mm.
Straits of Malacca (17 spms.)	..	..	112—118 "
North-east Sumatra (4 spms.)	..	..	110—117 "

### *H. c. minor*:—

Borneo (2 spms.)	..	..	100—102 "
Singapore (4 spms.)	..	..	102—104 "
Johore (4 spms.)	..	..	103—111 "

Dr. Oberholser's measurements for the wings of his two topotypes of *neophora* are; ♂ 100, ♀ vix ad. 111 mm.

<sup>1</sup> *Halcyon coromanda coromanda* Robinson & Kloss, Journ. Straits Branch Roy. Asiatic Soc. No. 80, 1919, p. 87.

<sup>2</sup> Hartert has already stated that birds from the southern part of the Malay Peninsula are *minor* (Vög. pal. Fauna, II, 1912, p. 887).

It seems to me that a difference between Bornean and Sumatran birds is as yet "not proven": Dr. Oberholser's material from each place was very limited and it may be noted that he was unable to distinguish between specimens of *Halcyon chloris* from those areas.

#### CHRYSOCOLAPTES STRICTUS CHERSONESUS Kloss.

Ibis, 1918, p. 113 (Singapore and Johore).

*Chrysocolaptes gutticristatus chersonesus* Robinson, Ibis, 1919, p. 181 ; Robinson and Kloss, Journ. Straits Branch Roy. Asiat. Soc. No. 81, 1920, p. 80.

*Chrysocolaptes gutticristatus* de Beaufort and de Bussy, Konink. Zool. Genoots, "Natura Artis Magister" XXI, 1918 (?) p. 25/.

*Chrysocolaptes guttacristatus delesserti* Baker Ibis 1919, p. 197.

Mr. Stuart Baker denies the validity of this race, because he believes that birds from Johore have wings as long as 170 mm. : but he has evidently made a bad geographical error in attributing to the extreme south of the Malay Peninsula, the specimens which he thinks come from Johore (Query : Jalor in Patani).

This subspecies, described on account of its small size, has now been found to extend to the islands of the Rio Archipelago and to Sumatra. I have examined the following specimens :—

♂ Si Karang, Johore (cotype).	Wing 150.	Bill from gape 45
♂ " " "	" 143	" " 43
♂ Singapore Island (cotype).	" 143.	" " 48
♂ " " "	" 146.	" " 45
—Kundur Id., Rio Arch.	" —	" " —
♂ Deli Dist. N.E. Sumatra.	" 150.	" " 48
♀ " " "	" 143.	" " 43

Wings 143-146\*-150 mm. Bills from gape 43-45\*-48 mm.

#### PHILENTOMA VELATA CAESIA (Less.).

The type locality of *Drymophila velata* Temm. (Pl. Col., No. 334, 1825), is Java as the species does not occur in Timor or the Moluccas.

Birds from Sumatra, Malay Peninsula and Borneo differ from those of Java in having more black on the throats in males ; while the throats of females are blackish blue, distinctly darker than the breasts.

Birds from each of these areas have received a name as follows :—

*Monarcha caesia* Less., Rev. Zool. 1839, p. 167 (Sumatra).

*Muscicapa pectoralis* Hay, Madras Journ. XIII, 1844, p. 161 (Malacca).

*Philentoma unicolor* Blyth, Ibis 1865, p. 46 (Borneo).

But all are alike and all must stand as *caesia*.

Specimens examined. Java, 4 ♂, 5 ♀ ; Sumatra, 3 ♂, 3 ♀ ; Malay Peninsula 12 ♂, 15 ♀ ; Borneo, 3 ♂, 3 ♀

\* Average.



## PHILENTOMA PYRRHOPTERA (Temm.).

**Philentoma saravacense** Bartlett, Sarawak Note-book, pt. IX (1896), p. 80.

This name was given by Bartlett to a blue flycatcher from the neighbourhood of Kuching. I have seen the type, a male, which belongs to the Sarawak Museum. It is of exactly the same size as *Philentoma pyrrhoptera* [*Muscicapa pyrrhoptera* Temm., Pl. Col. 1823, No. 596, fig. 2 (error! read 1) Borneo and Sumatra], but is of the same blue all over as the foreparts, except on the abdomen where the blue of the breast gradually changes more or less into sullied white.

Agreeing with the type are six other specimens for the moment in my hands:—a male and female (?) from Sarawak, two males from the Malay States, and two males from Sumatra. One of the Malayan specimens has the flanks slightly tinged with russet.

It has been suggested that this bird is the young of *P. velata*, but I am sure this is not so. It belongs to *P. pyrrhoptera*, of which, it seems to be an aberration—though as shown a comparatively common one—and is not a distinct species. The colour of the young male *P. pyrrhoptera* is apparently that of the adult female but rather paler on the throat.

**Philentoma intermedius** Hume, Stray Feathers, IX, 1880, p. 113.

This name was given to a female from Johore—an aberration like that named *saravacense* by Bartlett. As usual Hume's description is very full.

**Philentoma maxwelli** Bartlett Journ. Straits Branch Royal Asiatic Soc. No. 28, 1895, p. 96.

This name was given also to a Sarawak bird which is an ordinary male *P. pyrrhoptera* except for an irregular chestnut patch on one side of the blue breast—an abnormality I find in a Malayan example as well. I am indebted to the authorities of the Sarawak Museum for lending me the Bornean types of the synonyms. Malaysian birds are not separable into subspecies.

## CRYPTOLOPHA TRIVIRGATA.

Since we commented on Sumatran examples of *Cryptolopha trivirgata* (Journ. Fed. Malay States Mus. VIII, pt. 2, 1918, p. 167), the F.M.S. Museums have obtained a large series of this bird from Java and now comparing with them an equally large Sumatran series, I can detect no differences: the birds of the Sunda Islands are larger than other Malaysian birds and are of the typical form *C. t. trivirgata* (Strickl., type locality, Java)<sup>1</sup>.

<sup>1</sup> See, however, Nov. Zool. XXVII, 1920, p. 462 where Hartert States there is no difference in wing length. But the series on which my remarks are based is much larger than any other assembled.

In 1912 Dr. E. Stresemann found that Malayan birds were smaller than the Sondaic form and named them *Phylloscopus t. parvirostris* (Nov. Zool. XIX, p. 322, Mt. Tahan, 5,200 ft.). He omitted, however, to compare them with Bornean material, named by Sharpe *C. t. kinabaluense* (Bull. B.O.C. XI, 1901, p. 60). Sharpe described this as having a duller crown stripe, whitish underparts and a less yellow colour generally.

But when referring his material earlier to *Cryptolopha trivirgata* (Ibis, 1888, p. 202), Sharpe noted that amongst it, besides specimens as described, were a few examples of typical appearance : and he surmised that the latter were young birds. I think the reverse is more probably correct for I have immature specimens from Java and the Peninsula which approximate to his description.

An adult skin (wing 56 mm.) from Gunong Tanabo, N. Sarawak, does not differ from Malayan birds : one cannot dogmatise with a single specimen, but if it is typical of the adult *C. t. kinabaluense* then Malayan birds may have to bear that name with *C. t. parvirostris* as a synonym.

#### LALAGE FIMBRIATA.

I have been able to bring together series of *Lalage fimbriata* (Temm.) from Java, Malay Peninsula, Sumatra and Borneo. There is some lack of uniformity in each series, because immature males are paler than fully adult males in some races ; but having regard to adult birds only my conclusions are as follows :—

##### 1. *Lalage fimbriata fimbriata* (Temm.).

*Ceblephyrus fimbriata* Temminck Pl. Col. Nos. 249 (♂) and 250 (♀).  
Java.

Males perhaps a little darker than males from Malacca, Sumatra and Borneo, but only doubtfully so.

Females distinct : darker below, but less clearly banded (bars greyer, less black) owing to a general grey suffusion or clouding except on the throat and under tail-coverts where the ground colour is white.

The largest form : wings 99–107 mm. (9 ♂, 4 ♀).

Confined to Java.

##### 2. *Lalage fimbriata culminata* (Hay).

*Ceblephyrus culminatus* Hay, Madras Journ. Lit. & Sci. XIII, 1844, p. 157. Malacca.

Males not distinguishable from Javanese males.

Females much whiter and more clearly banded below.

Wings : Malay Peninsula, 95–100 (2 ♂ 4 ♀) ; Sumatra 91–98 (6 ♂ 3 ♀).

The Malay Peninsula south of Lat. 3° N. and Sumatra

##### 3. *Lalage fimbriata schierbrandi* (Pelz.).

*Volucivora schierbrandii* Pelzeln Novara Reis. Vögeln, 1865, p. 80, taf. 11, fig. 1. Borneo.

*Volucivora borneensis* Salvadori, Atti R. Ac. Sc. Tor. III, 1868, p. 532. Borneo.



Abdomen and undertail-coverts in males a trifle paler than in either *f. fimbriata* or *culminata*; but less white than in *neglecta*.

Females inseparable from those of *culminata*.

The smallest form: wings 90-95 mm. (9 ♂ 3 ♀ from Sarawak).

Confined to Borneo.

#### 4. *Lalage fimbriata neglecta* (Hume).

*Volucivora neglecta* Hume, Stray Feathers, V, 1877, p. 203. Extreme south of Tenasserim.

Males paler grey throughout than those of the above three races; heads and mantles not becoming blackish: abdomens and undertail-coverts white or whitish.

Females inseparable from all but the Javan race.

Wings 94-106 mm. (10 ♂ 8 ♀).

From Southern Tenasserim down to about Lat. 6° N. in the Malay Peninsula.<sup>1</sup>

Males from between Lat. 6° and 3° N. in the Peninsula are intermediate between *culminata* and *neglecta*, but on the whole are nearest the latter: in the abdomen and lower tail-coverts they resemble *schierbrandi*, but do not appear to develop the dark head and back of the Bornean bird. Wings 94-105 (5 ♂ 6 ♀).

#### MALACOCINCLA SEPIARIA.

In the Trans. Linn. Soc. (XIII, 1822, p. 158) Horsfield described *Brachypteryx sepiaria* from Java and in the Zeitschrift für die Gesammte Ornithologie (I, 1884, p. 21) Meyer described *Turdinus sepiarius* var. *minor* from the same island. In Notes from the Leyden Museum (XVII, 1895, p. 82) Buttkofer considered that the latter author could rightly do this as Horsfield's *sepiaria* was the paler-headed bird. This is actually the case.

I recently obtained in Java, birds which Mr. E. C. Stuart Baker has kindly compared for me with Horsfield's types in the British Museum. The latter represent the paler-headed form, so I am now able to definitely state that *Malacocincla sepiaria sepiaria* (Horsf.) is the Western and *Malacocincla sepiaria minor* (Meyer) the Eastern Javanese form.

Though the individuals of Meyer's type series have wings much smaller than my specimens, or any others on record from Java, it is accepted that they do represent a form of *sepiaria*.

Wing measurements of my specimens.

1. From West Java (Wynkoops Bay and Pandeglang district); 66, 67, 67, 68, 69, 71, 73.5 mm. *M. s. sepiaria*

<sup>1</sup> I have seen an undoubted example of *L. f. culminata* from Patani, however, showing that this race and *neglecta* may (occasionally) inosculate as well as intergrade.

2. From East Java (Bali Strait to Idjen Massif) ; 67, 68, 68, 74 mm. *M. s. minor*

3. From Mid Java (Karongbolang on the S. Coast, 40 miles E. of Tjilitjap) ; 72, 68, 76 mm. These are truly typical of neither form : the first might be placed with *s. sepiaria*, the others with *s. minor*.

Meyer gives wings of 61–64 mm. for *minor* ; 70–72 mm. for *sepiaria* : but there is no real difference in size as Buttikofer points out. See also Finsch (Notes Leyd. Mus. XXII, p. 220) who finds the wings to vary indiscriminately from 65 to 74 mm. as I do.

Except on the heads the colour differences given by Meyer are not visible in the freshly collected series.

#### CHIBIA HOTTENTOTTA.

1 ♂ ad., 1 ♂ imm., 2 ♀ imm., 1 ♀ juv. Badjoelmati, 30 miles north of Banjoewangi, East Java, 31st January—7th February, 1920.

Total length (♂♂, ♀♀) 308, 300, 285, 288. Tail, 144, 137, 128, 125. Wing, 155, 153, 150, 143. Tarsus, 25, 25.5, 25, 24. Bill from gape, 38, 38, 37, 35 ; from nostril, 25, 23, 22.5, 22 mm.

“Iris, adult male yellowish white, immature birds dark. Bill black, tip and gape whitish in immature birds. Feet black.”

The immature specimens lack the spangles on the head and breast and have no frontal hairs, shoulder plumes or curled tail feathers.

The colour and plumage characters of this bird are exactly those of *C. hottentotta* (which occurs on the Continent as far south as South Tenasserim and Cochin-China only ; for this species is another instance of that interesting anomaly in distribution in which a number of species common in Indo-China are absent in the Malay Peninsula, but appear again in Java and sometimes in Borneo and Sumatra) and apparently of *leucops*, Wallace, of Celebes and *pectoralis* Wallace, of the Xulla Islands. In the shape of the bill it agrees with the two last, the bill being higher, less tapering and more keeled than in continental birds : it is in fact the bill of the so-called *Dicruropsis sumatranus* (Wardl. Rams.) somewhat elongated ; and larger of course, to agree with the size of the bird. Except for larger size and perhaps a proportionately slightly heavier bill, it scarcely differs from *borneensis* Sharpe.

The iris is yellowish white, thus closely agreeing with *leucops*.

I cannot definitely determine the form for lack of material and literature : from the Thousand Islands at the N.W. end of Java *termeuleni* has been described by Finsch and from Kangean Id., at the N.E. end, *jentinki*, by Vorderman.



The specimens constitute a new record for Java. I have no hesitation in including them in *Chibia* for there seems to me no reason why those birds which have been placed in *Dicruopsis* should be excluded from the earlier genus: all link up too closely to be separated. Sharpe long ago expressed the same opinion with regard to the genus of these birds (P.Z.S. 1879, p. 247).

Since Mr. Stuart Baker published the results of his study of continental material of the species *Chibia hottentotta* (Nov. Zool. XXVI, 1919, p. 44), I have been able to examine, side by side with the specimens in the F.M.S. Museums, the collection of these birds belonging to the Indian Museum.

On the whole this material confirms Baker's conclusions (except that being smaller the series shows a smaller range in dimensions and presents one or two anomalies<sup>1</sup>), viz., that in the North of India from the Northwest to the Eastern Himalayas and Assam—and perhaps North Burma and the Shan States—the birds are, on the whole, larger; whereas in Bombay, Central India, Bengal, South Burma and Siam to Cochin-China and Annam they average not so large.

But investigation of material should go hand in hand with investigation of literature and Baker has omitted a study of the latter. It is certainly a less interesting pursuit.

It is open to anyone to select a type locality for a form which has been described without one and often, of course, it is largely a matter of chance whether the choice made is anywhere near correct: but the selection should at least have the *appearance* of probability. As the type locality for a bird known to Brisson and Linneus Sikkim seems so improbable that the fixation may be disregarded.

But in this case there is another reason for rejecting it. As a type-locality the region including Sikkim is preoccupied. Baker considers birds from Nepal, Sikkim and Bhutan to be alike and the Nepal bird has been described by Gould as *Edolius chrishna* (P.Z.S. 1836, p. 5) and by Hodgson as *Edolius casia* (Indian Review, 1, 1836-7, p. 324). Until the longer-winged, longer-billed northern birds are separated into races by some reviser the name they must all bear is *Chibia hottentotta chrishna* (Gould).

Other places which are perhaps debarred from selection as type localities of the original form are Borabhum and Dholbhum, Chota Nagpur, (*Criniger splendens* Tickell, Journ. Asiat. Soc. Bengal II, 1833, p. 574); and Bengal (Calcutta), the locality given by Latham for his Crishna Crow (Gen. Hist. Birds, III, 1822, p. 51, pl. XI) which is the same as *Edolius barbatus* Gray (Zool. Misc., 1831, p. 34).

<sup>1</sup> Specimen from Upper Burma, wing 166, bill from nostril 26; from Loismampa, Shan States, wing 180, bill from nostril, 26 (it is possible that more material may show these to be the Chinese form): from South of Irawadi, wing 179, bill 29 mm,

For the type locality of *Chibia h. hottentotta* I select Siam. As in the case of *Cuculus (Dissemurus) paradiseus*, Linneus based the species on Brisson who recorded Siam as the native country of the latter bird. In Journ. Nat. Hist. Soc. Siam, III, 1919, p. 453, I restricted the type locality to the region between Ayuthia and the head of the Gulf and now select the same district for *C. h. hottentotta*. Mr. W. J. F. Williamson has obtained specimens from near Bangkok (l.c.s. p. 45).

As thus localised *C. h. hottentotta* comes nearest, of recognised races, to *C. h. brevirostris* of China (type locality Chusan), but has a rather longer bill, but somewhat shorter wing.

It seems that there are (1) in the north a larger bird with (a) a large bill in the Himalayas (*chrisna* Gould) and (b) a small bill in China (*brevirostris* Cabanis) : (ii) in the south a rather smaller bird with a bill of intermediate size (*hottentotta* Linn.). Whether the bird of Bombay and Central India in distinct requires, as Mr. Baker says, a larger series than is available to show. I fancy it is not : the few measurements given are well within the range of a series from Burma and Siam.

Thus we have on the Continent at present :—

<i>C. h. hottentotta</i>	S. Indo-China and Peninsula India.
<i>C. h. chrisna</i>	Himalayas, etc.
<i>C. h. brevirostris</i>	Eastern China.

#### MALAYSIAN CROWS.

#### CORVUS CORONOIDES.

To a number of the "Verhandlungen der Ornithologischen Gesellschaft in Bayern," received only recently, Dr. Erwin Stresemann contributes a long and interesting paper on the forms of the group<sup>1</sup> *Corvus coronoides* Vig. & Horsf. (Band XII, Heft 4, May 1916, pp. 277-304).

The following is a rough translation of the parts with which this note deals :—

(p. 284). *Corvus coronoides andamanensis* Beavan.

*Corvus andamanensis* Beavan ex Tytler MS. [Ibis 1866, p. 420—Andamans : nomen nudum !] Ibis 1867, p. 328—Andamans.

Like *C. c. intermedius*, but on the average with shorter wings and a longer, higher bill. Base of feathers in adults more or less pronounced white, never grey.

Length of wings : Assam : 328, 337. Upper Burma : 294-343 (6 examples)<sup>2</sup>. Tenasserim : 279-343. (Average of 12 examples : 312.8). Penang : 331. Andamans : 292-341 (Average of 10 examples : 313.1).

<sup>1</sup> Or species, as I should probably say. C.B.K.

<sup>2</sup> I have omitted a number of individual measurements throughout. C.B.K.



Length of bill : Assam 61, 62. Burma : 57, 58. Tenasserim : 58.5, Penang, 60. Andamans : 54-62.5 (Average of 13 examples : 58.5). Average of 20 examples : 58.9.

Height of bill : Minimum 20.5, maximum 24.1. Average of 22 examples : 22.2.

Distribution : Assam and Burma, southwards to Tenasserim and Penang<sup>1</sup>; Andamans. The range of the form probably extends to the northern part of the Malay Peninsula also though no examples seem as yet available. All crows which I have seen in Museums from the Malay Peninsula and those which I shot in Perak myself were *Corvus enca compiler* Richmond. It is, therefore, not clear how one should regard the "*Corvus macrorhynchus*" which Robinson and Kloss record in Ibis 1911, p. 71, as "very abundant in Trang and also in Langkawi and Terutau" especially as these investigators add the astonishing remark "From Perak southwards to Johor the Slender-billed crow, *Corvus enca* Horsf., occurs, but is very rare, only three or four specimens having been obtained" (!). A transfer of names between the two species appears to me as not improbable.

(p. 287). *Corvus coronoides macrorhynchus* Wagl.

sp. 3 (1827—Java. Type in the Munich Museum).<sup>2</sup>

*Corvus macrorhynchus* Wagler ex Temminck MS., Syst. Av. Corvus

*Corvus timorensis* Bonaparte, Compt. Rend. 37, p. 829 (1853—Timor).

Like *C. c. andamanensis* and *intermedius*, but with bill of different shape : bill at the base about as high as over the nostrils. Base of the feathers in adults always white, in young birds brownish white. Iris brown.

Examples from the Timor group do not appear to completely agree with birds from the typical locality : but differ in having a shorter bill on the average, clearer white bases to the feathers and a rather stronger gloss below ; but the Javanese material I have examined<sup>3</sup> is insufficient for me to decide the question.

Length of wings :

Java : 335, 350. Bali : 356. Kangean : 320, 365. Lombok : 353. Lombok : 328, 348. Alor : 340. Wetar : 320-347 (6 examples). Timor : 314-335 (4 examples). Savu : 324. Sumba : 323.

Average of 26 examples : 336.4.

<sup>1</sup>The British Museum possesses two examples from Penang. Coll. A. R. Wallace and Dr. Cantor. E. S.

<sup>2</sup>Cf. Parrot, Zool. Jahrb., Abt. Syst. etc., 23, 1906, p. 272.

<sup>3</sup>One example only. C.B.K.

Length of bill :

Java : 62, 69. Bali : 61. Kangean : 67. Lombok : 61, 67.5. Flores : 62, 62.5, 64. Lomblen : 61, 64.5. Alor : 62.5. Wetar : 59–65.5 (5 examples). Timor : 57.5, 58.5. Savu : 57.5. Sumba 58.

Average of 21 examples : 62.2.

Height of bill : minimum 20.1, maximum 24. Average of 21 examples : 22.3.

Distribution : Chain of islands from Java to Timor. Sumatra<sup>1</sup> ? Borneo<sup>2</sup> ?

\*       \*       \*       \*       \*       \*

Summarising the measurements given by Stresemann we have :—

Wing length :—

<i>andamanensis</i>	min. 279 ;	max. 343 ;	average 313 mm.
<i>macrorhynchus</i>	„ 314 ;	„ 365 ;	„ 336.4 „

Bill from gape :—

<i>andamanensis</i>	„ 54 ;	„ 62.5 ;	„ 58.9 „
<i>macrorhynchus</i>	„ 57.5 ;	„ 69 ;	„ 62.2 „

Bill height :—

<i>andamanensis</i>	„ 20.5 ;	„ 24.1 ;	„ 22.2 „
<i>macrorhynchus</i>	„ 20.1 ;	„ 24 ;	„ 22.3 „

The subspecies *macrorhynchus* is shown to have both a longer wing and a longer bill than *andamanensis*. The heights of the bills provide no differential dimensions ; but as regards shape Dr. Stresemann states that the culmen of *andamanensis* has its highest point above the nostril [*i.e.*, the profile is arched proximally] : that of *macrorhynchus* is no higher above the nostril than at the base [*i.e.*, the profile is straight proximally].

Dr. Stresemann goes on to say (pp. 295–6) :—“It is very surprising to find that there is a broad space between the two areas of distribution of the closely allied forms *andamanensis* and *macrorhynchus* : this is—strangely enough—occupied by a crow of another species, *Corvus enca compiler* ! In all parts of the latter's range, the southern half of the Malay Peninsula, Sumatra, Nias, Simalur, Borneo—so far as reliable reports go<sup>3</sup> there is no representative of the *coronoides* species as we should expect ; at least in the southern half of the Malay Peninsula and in Sumatra which are parts of the old land bridge from India to Java. This is a case of allied, but

<sup>1</sup> Cf. Stone, Proc. Acad. Nat. Sci. Philadelphia, 1902, p. 690 : perhaps an error for *Corvus enca compiler* ! E. S.

<sup>2</sup> Fide Finsch, Notes Leyden Mus. XXII, p. 245. E. S.

<sup>3</sup> Finsch indeed records *Corvus macrorhynchus* from Borneo, but probably means *compiler*. E. S.



heterogeneous species excluding each other geographically. In spite of the broad zone of separation *andamanensis* and *macrorhynchus* have remained very similar—so similar that the majority of modern ornithologists declare them to be identical.”

Dr. Stresemann could be accused of manipulating literature to fit a theory. In stating that no examples of *coronoides* seem available from the northern part of the Malay Peninsula he ignores our record of specimens from Trang, etc., where it was very abundant. In stating that it does not occur in the southern half of the Peninsula he ignores our next remark. “In the southern half of the Peninsula it is scarcer being only seen in numbers on the coast in the vicinity of fishing villages.” This last does away with his “broken land bridge” theory !

And when he wrote “From Perak to Johor the Slender-billed Crow, *Corvus enca* occurs, but is rare, etc.” and suggests (as I understand), that we have transferred the names of two species he stultifies himself—for if he believes that our *enca* of the Southern Malay Peninsula is *coronoides* he himself builds a bridge which he later demolishes.

There is no break in distribution—as far as the Peninsula is concerned.

Why is our opinion astonishing that *Corvus enca* is rare in the Malay States ? It is based on the experience of good many years : rather there is ground for astonishment that in probably little more than as many days in the country Dr. Stresemann found it, by inference, common.

As to Borneo and Sumatra Dr. Stresemann makes the same suggestion regarding the birds determined by Finsch and Stone as he does about our identification. Personally I have only seen examples of *C. enca* from these two islands, but it seems to me that, for the present, negative evidence is little better than no evidence.

The conclusion arrived at by Dr. Stresemann’s methods is that only one form of *C. coronoides*, viz., *andamanensis*, occurs in the Malay Peninsula, and that the species (apart from its occurrence at Penang), may extend from Burma to the northern part of the Peninsula only. Also that *Corvus enca compiler* is the common form.

I will now proceed to give some account of the Malaysian specimens of Crows at present in the F.M.S. Museums and, as no instructions have ever been given to our collectors to discriminate between the two species when procuring examples, it may be taken that the numbers secured fairly represent the rarity or commonness of the two birds. They show that as far as our experience goes we can repeat our former statement that *coronoides* is the commoner bird and in some form occurs throughout the Malay Peninsula.

Malay Peninsula :		Wing.	Bill from gape.	Bill height.	Sex.
<i>Indo-Chinese Specimens :—</i>					
Kraburi, Pakchan Estuary	..	326	67	24	♂
" "	..	325	66	23	♂
" "	..	313	64	22	♀
" "	..	302	63	21	♀
Ghirbi	..	320	64	21	♀
Koh Samui, Bandon	..	352	64	24.5	♂
Trang	..	310	59.5	22	♀
Telibon Id., Trang	..	333	67	25	♂
<i>Malayan Specimens :—</i>					
Terutau Id.	..	340	63	24.5	♂
Langkawi Id.	..	340	67	24.5	♂
" "	..	307	63	23.5	♂ vixad.
Temangoh, Upper Perak	..	324	63	23.5	♀
" "	..	322	64	24	♀
Taiping, Perak	..	344	66	22	♂
" "	..	325	60	21	♂
" "	..	350	66	24	—
" "	..	305	60	22.5	—
Bukit Gantang, Perak	..	306	61.5	22.5	♂
Trengganu	..	321	63	24	♂
" "	..	327	58	23	♂
Pulau Jarak, Straits of Malacca..	..	340	59	23	♀
Kuala Selangor	..	285	59	22	♀ subad?
" "	..	292	60	22	♀ do
" "	..	313	60	22	♀
Batu, Selangor	..	311	64	22.5	♂
" "	..	328	65.5	24.5	♀
<i>Java :—</i>					
Buitenzorg	..	340	63	23	♂
" "	..	308	57	23.5	♀
" "	..	323	58	23	♀

Twenty-six examples of *coronoides* against six of *enca* (vide postea) from the same area !

The birds of the Malay Peninsula have both the larger wing and longer bill ranges of *macrorhynchus* and must, I think, be placed under that name, for as regards the forms of the bill the differences stated by Dr. Stresemann do not seem to hold : I find both shapes in the Malayan series and of the three Javan birds one has the bill higher at the nostrils than at the base, while in the other two, the height at both places is the same.

My conclusions are therefore that a form of the species *Corvus coronoides* occurs throughout the whole of the Malay Peninsula where it is much commoner than the species *Corvus enca* ; and that south of Tenasserim (say Lat. 11° N.) it is *Corvus coronoides macrorhynchus* Wagl.

#### CORVUS ENCA.

Six specimens have been obtained during the same period and in the same area as the 26 examples of *C. coronoides* recorded above : the apparant occurrence is therefore, only one to four. The details are :—



		Wing.	Bill from gape.	Bill height.
<b>Malay Peninsula :</b>				
Taiping, Perak	..	316	65	22.3
"	..	310	62.5	20
"	..	303	60	20
"	..	304	61.5	20 vix. ad.
Bentong, Pahang	..	324	62	22.7
Ulu Langat, Selangor	..	307	61.5	22.5

Specimens from Borneo and Sumatra, (the latter submitted by Mr. E. Jacobson), measure :—

Locality.		Wing.	Bill from gape.	Bill height.
<b>Borneo :</b>				
Balangian, Sarawak	..	315	61	22
Samarahan "	..	308	61	23
<b>Sumatra :</b>				
Padang Highlands	..	320	61	21.5
"	..	300	61	22
"	..	298	63.5	22
"	..	317	65	21.5
"	..	322	64.5	23
"	..	305	60.5	21.5
"	..	309	61.5	22
"	..	314	63.5	20.5
"	..	305	60	21.5

All these are alike and must all be known as *Corvus enca compiler* Richmond (Proc. U. S. Nat. Mus. XXVI, 1903, p. 518. Type locality : Simalur Id., W. Sumatra).

*Corvus enca enca* (Horsf.) of Java is smaller and the bill is in some respects more like that of *C. c. macrorhynchus* than its own subspecies *compiler* : viewed laterally it is less wedge-shaped, *i.e.* the profile does not begin to taper so quickly.

Four adult specimens obtained by me in 1920 measure :—

	Wing.	Bill from gape.	Bill height.
<b>Java :</b>	282	55	19
	280	54	19
	273	54	16.5
	272	56	17

## XII. SEVEN NEW MALAYSIAN MAMMALS.

BY C. BODEN KLOSS, F.Z.S.

1. *Balionycteris maculata seimundi* subsp. nov.

Like *B. m. maculata* (Thos.) of Borneo but with the postorbital processes much less developed ; short and obtuse instead of pointed and elongated.<sup>1</sup>

Male. Head and nape black, shoulders and mid-back mummy brown; rump and sides cinnamon brown. Underparts hair brown, the fur of the abdomen tipped with drabby white, of the fore-neck very indistinctly with drab. Ears and membranes black ; a small tawny spot on the anterior margin of the ear near the base, another near the inner angle of the eye and a pale streak near the angle of the mouth : finger joints tawny and a few small tawny spots scattered irregularly over the wing membranes. The undersurface of the fore limbs and the membranes near the body distinctly clad with whitish hair.

Female. Only differs from the male in having no drab on the fore-neck and less cinnamon brown on the rump.

*Co-types.* Adult male and female (skins and skulls) from the junction of the Taban and Teku Rivers at the foot of Gunong Tahan, Pahang, collected by Mr. E. Seimund on 26 February 1921, F.M.S. Mus., No. 1/21 and 2/21.

*Specimens examined.* The co-types and three alcoholic specimens, viz., a female with a young one and a gravid female : all of which formed a small bunch in the forest.

*Collectors external measurements of male and female :* head and body, 57, 57 ; forearm, 43, 42 ; hindfoot, 9, 9 ; ear, 9, 9 mm.

*Skull measurements :* greatest length, 22.5, 22.4 ; condylo-basal length, 21.1, 21.1 ; palatal length, 11.0, 11.2 ; maxillary tooth row including canine (alveoli) 7.0, 7.0 ; interorbital breadth, 5.2, 4.8 ; breadth across postorbital processes, 7.3, 6.5 ; breadth of braincase, 10.2, 10.0 ; zygomatic breadth, 15.6, 15.1 mm.

*Remarks.* Until last year the two Cynopterine genera *Balionycteris* and *Dyacopterus* were only known from Borneo where each is represented by a single species, *B. maculata* (Thos.) and *D. spadiceus* (Thos.). In Ann. and Mag. Nat. Hist. (9) V, 1920, p. 284, Mr. Thomas described a race of the latter, *brooksi*, from specimens collected near Bencoolen, Sumatra, by Mr. C. J. Brooks and now we have discovered the former in the Malay Peninsula. We may reasonably expect to meet someday with *Dyacopterus* in the Peninsula and *Balionycteris* in Sumatra.

<sup>1</sup> Cf. Andersen, Cat. Chir. Brit. Mus. I, 1912, p. 655, fig. 55.



2. *Petaurista punctata sumatrana* subsp. nov. (Pl. III).

Like *P. p. punctata* of the Malay Peninsula but much less flecked with white: the spots being almost absent on head, neck, shoulders, rump, thighs and basal part of tail.

Skull generally similar but rostrum broader and shorter: zygomata noticeably broader and more bowed outward anteriorly; but interpterygoid space and basi-occipital narrower: tooththrows not converging anteriorly.

*Type.* Adult female, skin and skull, from the Padang Highlands, West Sumatra (probably near Fort de Kock). Obtained by E. Jacobson on 29 May 1918. Original number E. J. 398.

*External measurements taken in the flesh:* head and body 345; tail 375; hindfoot 65; ear 29 mm.

*Skull measurements:* greatest length, 62.3 (63.0)<sup>1</sup>; basilar length, 51.0 (50.5); diastema, 13.2 (13.2); upper tooth row, 13.9 (14.0); interpterygoid breadth, 5.1 (6.2); breadth between bullae, 9.0 (11.0); anterior and posterior breadths of combined nasals, 11.4, 7.7 (10.5, 6.9); median length of nasals, 17.0 (19.0); zygomatic breadth, 42.0 (42.0); mastoid breadth, 32.5 (33.0).

*Remarks.* This is the first time this interesting squirrel has been taken in Sumatra. *P. punctata* seems to be a rare animal everywhere. Other forms have been described from S. Yunnan (*marica* Thos.) and the Chin Hills (*sybilla* Thos.). Apparently a mountain species.

3. *Sciurus notatus tamansari* subsp. nov.

Like the animal inhabiting the lowlands of East Java<sup>2</sup> but darker and more richly coloured throughout.

Head, body and limbs above less grey, more olivaceous, the pale parts of the grizzle being ochraceous. Fore and hind feet darker grey, contrasting more strongly with the limbs. Ears and sides of head and neck ochraceous. Underparts darker, nearly ochraceous-orange. Tail more richly coloured both above and below, the lower median line like the under-body.

*Type.* Adult female (skin and skull) from Tamansari, Idjen Massif, 1,600 ft., about 15 miles westwards from Banjoewangi, East Java. Collected on 18 January 1920 by C. Boden Kloss. Original No. 8,634: F.M.S. Mus. No. 34/20.

*External measurements taken in the flesh:* head and body, 200; tail, 185; hindfoot s.u., 45; ear, 18 mm.

<sup>1</sup>Measurements in parentheses those of an adult male from the Larut Hills near Taiping, Perak, 2,100 ft., F.M.S. Mus. No. 1427/11.

<sup>2</sup>To some extent this resembles, as might be expected, *S. n. madurae* Thos. (Ann. & Mag. Nat. Hist. (8), V, 1910, p. 386; Madura Id.).

*Skull measurements* : greatest length, 50.0 ; condylo-basilar length, 43.5 ; palatilar length, 21.5 ; diastema, 12.0 ; upper molar row (alveoli) 11.2 ; median nasal length, 13.0 ; interorbital breadth, 15.5 ; zygomatic breadth, 29.0 mm.

*Specimens examined.* Five from the type-locality compared with eight from Badjoelmati in the lowlands of Besoekei, E. Java.

*Remarks.* This form possibly closely resembles *S. n. stresemanni* Thos. of Bali (Ann. & Mag. (8) XI, 1913, p. 503) ; but it has very conspicuous orbital rings and the head is apparently less ochraceous.

All recent writers on *Sciurus notatus*—Thomas, Bonhote, Robinson and Wroughton—have treated the old names which have been given the species as synonyms of *S. n. notatus* ; and to put matters on a clear footing I select Western Java as the typical locality of *badjing*, Kerr (1792) and *biliniatus* Desm. (1817) ; we know that *notatus* Bodd. (1785), *plantani* Ljung (1801) and *andrewsi* Bonh. (1901) came thence. And though *dschinschinus* Gm. (1788) and *gingianus* Shaw (1801) are based on the "Ecuriel de Gingi" of Sonnerat, supposed to have come from Pondicherry, I have little doubt but that they also are *notatus* squirrels. If so—typical locality West Java.

Therefore, of this squirrel, we have in Java at present :—

<i>S. n. notatus</i> (with synonymy as above)	West Java.
<i>S. n. balstoni</i>	Mid Java.
<i>S. n. tamansari</i>	Idjen Massif, East. Java.

All the *notatus* squirrels I have yet seen from West Java are grey-bellied animals, though the axillae and inguinal region are generally buffy or tawny : all the East Javan specimens I have examined are entirely buff or tawny beneath. *S. n. balstoni* from South Mid-Java is described as "below pinkish-buff, but as the hairs have long black bases this colouring is much disguised except on the inner sides of the limbs where the hairs are entirely buff" (Robinson and Wroughton, Journ. Fed. Malay States Mus., 1V, 1911, p. 234. Tjilitjap).

##### 5. *Sciurus nigrovittatus besuki* subsp. nov.

Like *S. n. nigrovittatus* Horsf. of West Java<sup>1</sup> but with the underparts a less clear grey, the tips of the hairs less white being often considerably sullied with buff. Muzzle, sides of head and neck and the chin dull ochraceous, distinctly less intense and bright.

*Type.* Male, vix ad. (skin and skull) from Tamansari, Idjen Massif, 1,600 ft., East Java. Collected on 17 January 1920 by C. Boden Kloss. Original No. 8,629, F.M.S. Mus. No. 29/20.

<sup>1</sup> I select West Java as the typical locality for *S. nigrovittatus* Horsf., and also for *S. griseiventer* Desm.



*External measurements taken in the flesh* : head and body, 182 (185)<sup>1</sup> ; tail, 160 (160) ; hind foot, 41 (43) ; ear, 16 (16).

*Skull measurements* : greatest length, 46·3 (50) ; condylo-basilar length, 39·4 (43) ; palatilar length, 19 (21) ; diastema, 10·5 (12·8) ; upper molar row, alveoli, 9 (9) ; median nasal length, 12·4 (14·5) ; interorbital breadth, 17·2 (17·6) ; zygomatic breadth, 28 (29).

*Specimens examined.* Twelve from the type locality and twenty-two from Sodong Jerok, 4,000 ft., and Ongop Ongop, 5,700 ft., Idjen Massif, East Java, compared with many examples of the typical form from Mid-Java (Karangbolang, East of Schildpadden Baai) and West Java (Mt. Gedeh, 4,000–8,000 ft. ; Wynkoops Baai and Pandeglang).

*Remarks.* The West Javan form of *S. notatus*<sup>2</sup> bears some resemblance to this race in having the ventral surface largely grey, sometimes washed with buffy, and the colour of the underparts is therefore no distinction, broadly speaking, between the two species which are differentiated as follows :—

<i>S. notatus.</i>	<i>S. nigrovittatus.</i>
Pale edges to eyelids distinct.	No distinct pale edges to eyelids.
Fore and hind feet grey markedly contrasting with limbs and back.	Fore and hind feet scarcely differing from limbs and back.
Tail generally tinged with rufous at tip.	Tail generally markedly black at tip.
Pale lateral stripes well defined.	Pale lateral stripes less defined.
Dark lateral stripe less distinct and coloured like sides and back.	Dark lateral stripe black, distinct.
Skull narrower.	Skull broader.

The distribution of *S. notatus* and *nigrovittatus* in Java, as experienced by members of the F.M.S. Museums during two collecting visits, may be of interest.

East Java :—

At Badjoelmati, in the lowlands of Besoeki, only *notatus* was met with.

At Tamansari, Idjen Massif, 1,600 ft., both *notatus* and *nigrovittatus* were found.

At Sodong Jerok, 4,000 ft., and Ongop Ongop, 5,700 ft., on the Idjen, only *nigrovittatus* was found.

Mid Java :—

At Karangbolong on the south coast only *nigrovittatus* was met with.

<sup>1</sup> Measurements in parentheses those of an old female from the type locality : Original No. 8,639, F.M.S. Mus. No. 39/20.

<sup>2</sup> Well described by Bonhote under the name of *Sciurus andrewsi* in Ann. & Mag. Nat. Hist. (7), VII, 1901, p. 456 : his type being from Tjigombong, south of Buitenzorg.

West Java :—

At Tjibodas, 4,000 ft., and Kandang Badak, 8,000 ft., Mt. Gedeh, only *nigrovittatus* was obtained.

At Wynkoops Baai were collected both *notatus* (one example) and *nigrovittatus* (many specimens).

In the district of Pandeglang, Bantam, both species were equally common.

6. *Lariscus niobe vulcanus* subsp. nov.

Differs from *L. n. javanus*<sup>1</sup> in having the hairs of the tail tipped with buff or tawny instead of white.

*Type.* Adult male (skin and skull) from Ongop Ongop, Idjen Massif, 5,700 ft., Besoeki, East Java. Obtained on 9 April 1916 by F.M.S. Museum collector. No. F.M.S. 356/16.

*External measurements taken in the flesh* : head and body, 185 ; tail, 115 ; hind foot, 46 mm.

*Skull measurements* : greatest length, 48·5 condylo-basilar length, 40·0 ; palatilar length, 20·0 ; diastema, 12·0 ; upper molar row (alveoli) 9·0 ; median nasal length, 14·5 ; interorbital breadth, 12·0 ; zygomatic breadth, 27·0 mm.

*Specimens examined.* Twelve from the Idjen Massif between 4–6,000 ft., compared with eight examples of *L. j. javanus*.

Seven of the latter come from West Java (Wynkoops Baai and Pandeglang) ; but one is from Tamansari, Idjen Massif, 1,600 ft. : it is therefore probable that *L. j. javanus* is the lowland and sub-montane form throughout the whole of Java.

7. *Rattus bukit temmincki* subsp. nov.

A very dark form of *Rattus bukit* (Bonh.). Considerably duller than *R. b. bukit* of the Malay Peninsula : much duller and darker than *R. b. treubi*<sup>2</sup> of the mountains of Java.

Above mingled mummy-brown and ochraceous-tawny the latter strongest on the sides of the head and neck and flanks : limbs greyer : fore and hind feet white with dark mesial stripes. Dorsal spines greenish grey basally. Below creamy sharply margined and extending to the fore feet, but not to the ankles. Tail bicoloured with a white tip.

*Type.* Adult female (skin and skull) from Badjoel-mati, north of Banjoewangi, Besoeki, East Java. Collected on 29 January 1920 by C. Boden Kloss. Original No. 8,676, F.M.S. Mus. No. 76/20. Mammæ 2—2—8.

<sup>1</sup>Thos. & Wr. Abstr., P.Z.S. 1909, p. 19 ; P.Z.S. 1909, p. 389 (Buitenzorg, 855 ft., West Java).

<sup>2</sup>Robinson and Kloss, Ann. & Mag. Nat Hist. (9) IV, 1919, p. 376 (Tjibodas, Mt. Gedeh, West Java, 5,000 ft.).



*External measurements taken in the flesh* : head and body, 140 ; tail, 178 ; hindfoot, s.u., 30·5 ; ear, 21 mm.

*Skull measurements* : greatest length, 35·0 , condyle-basilar length, 28·8 ; diastema, 8·4 ; upper molar row (alveoli) 6·0 ; length palatal foramina, 5·6 ; median nasal length, 12·9 ; breadth combined nasals, 4·0 ; zygomatic breadth, 16·0 mm.

[The largest specimen, a male from Karangbolang measures : head and body, 147 ; tail, 190 ; hindfoot, 28·5 ; ear, 20. Skull : greatest length 36·0 ; zygomatic breadth, 17·5 mm.].

*Specimens examined.* The type, two from Tamansari, Idjen Massif, 1,600 ft., Besoeki ; and two from Karangbolang, east of Schildpadden Baai, Mid Java. Compared with many paratypes from Tjibodas and a large series from Sodong Jerok, 4,000 ft., and Ongop Ongop, 6,000 ft., Idjen Massif, East Java.

*Remarks.* This seems to be the lowland and submontane form throughout Java while *R. b. treubi* is found on the mountains at higher altitudes.

The pelage is much less profuse and is stiffer than in the mountain representative ; but I do not regard this as a racial character for if individuals of the mountain form were transferred to the plains they, or their first offspring, would probably at once assume the more spiny, less furry coat of the lowland animal.

## XIII. NOTES ON SOME MAMMALS FROM SUMATRA.

BY E. JACOBSON.

(Plate III).

In the Journal of the Federated Malay States Museums, Vol. VII, December 1919, Messrs. H. C. Robinson and C. Boden Kloss published some papers on mammals obtained by me in different parts of Sumatra (pp. 257-291, 299-323). Below I give some additional data regarding these collections. Some hares I obtained at a later date have also been described by Mr. Boden Kloss and myself (tom. cit. pp. 293-298).

1. *Nesolagus netscheri* (Schleg.).

Of the extremely rare Sumatran Hare I obtained altogether *seven* specimens. Besides the four specimens enumerated by Mr. Boden Kloss on page 296, I caught :—

One specimen at Balun, in the District of Muaro Labuh (Padang Highlands), July 1914.

Two specimens at Sungai Kumbang, at the foot of Korinchi Peak, August 1915.

These three specimens were sent to the Leyden Museum of Natural History. Of the four specimens examined by Mr. Kloss three have been sent also to the Leyden Museum and one has been presented by me to the British Museum.

Where such a rare species is concerned, it is worth while to record all specimens which have been obtained.

In August 1895 a living specimen was bought by the Zoological Gardens at Amsterdam from a sailor, who had obtained it at Padang (West coast of Sumatra), the exact locality where it came from being unknown. The animal was in very bad condition and had lost one of its hind-legs. At the Zoological Gardens it was fed with bran, radishes, carrots, bread, young shoots of oak, elm, and beech. Very soon after its arrival, in September of the same year, it died having remained always very shy and timorous. The skin and skull are preserved in the Museum of the Gardens.

The Leyden Museum received in August 1916 a skin and a skull of *Nesolagus netscheri* from Mr. Stolz at Surian (District Alahan Pandjang, Padang Highlands), a place not so very distant from Balun, where I obtained my first specimen.

The Zoological Museum at Utrecht possesses two specimens of the Sumatran Hare preserved in spirits.

"Another specimen of *N. netscheri*, is in the possession of the British Museum (Natural History); and I am informed by Mr. Oldfield Thomas that Dr. Forsyth-Major made use of it when writing his well-known paper on Leporidae. The example is said to have come from Padang, but this is most certainly not correct and probably due to



the careless manner in which the collecting locality is often indicated by laymen. The specimen cannot have come from Padang or its direct surroundings for the same reason (pointed out by me in the Journ. F.M.S. Mus. VII, p. 293) that the type specimen cannot have been caught at Padang Pandjang. I presume that it was obtained on some coffee estate in the Barisan Mountains and from there sent to Padang."

This brings the number of specimens in Museums, as far as I have been able to ascertain, to a total of thirteen.

[A reference to *Nesolagus netscheri* not yet mentioned in this Journal is :—

*Lepus netscheri* Jent, Cat. Mus. d'Hist. Nat. Pays. Bas, IX, 1887, p. 239, pl. 9, figs. 1, 2 & 3 : representing the skull of the type in three aspects. C.B.K.].

## 2. *Arctonyx collaris hoeveni* (Hubr.).

In Messrs. Robinson and Kloss' paper the measurements of the female specimen (No. E. J. 116) I obtained in the forest near Suban Ajam (Bencoolen) were not given. I therefore state them here :

Head and body, 580 ; tail, 160 ; hindfoot, 91 ; ear, 31 mm.<sup>1</sup>

## 3. *Mydaus javanensis* (Desm.) subsp. *javanensis* ? (Syn. *Mydaus meliceps*, Cuv.).

In the list of Sumatran mammals given by Messrs. Robinson and Kloss (Journ. F.M.S. Mus. VIII, Part II, 1918, pp. 73–80) *Mydaus javanensis* has been left out. This animal is rather common in Bencoolen from the coast up to a great altitude in the interior. Mr. Westenenk, when Resident of Bencoolen, shot one in his garden at the town of Bencoolen (sea level) and several more were killed by his dogs at Kapahiang, higher up in the Barisan Mountain Range. When I was at Suban Ajam at the foot of Mt. Kaba (Bencoolen) at 1,200 metres (3,700 feet) I noticed the smell of one of these animals in the forest near our camp. The odour is not to be mistaken and is so powerful

<sup>1</sup> The skin of this specimen was unfortunately destroyed by insects ; the skeleton and skull are now in the Leyden Museum of Natural History.

From my collections of mammals from Bencoolen, Palembang, South-West Sumatra, and the Ophir Districts described by Messrs. Robinson and Kloss besides the specimen of *Arctonyx collaris hoeveni* mentioned above, nine more skins have also been destroyed by insects, viz. :—

*Pithecus melalophos melalophos*, No. E.J. 23 ; *Felis marmorata*, No. E.J. 214 ; *Felis bengalensis sumatrana*, No. E.J. 70 ; *Paguma larvata leucomystax*, No. E.J. 196 ; *Gymnura gymnura gymnura*, No. E.J. 57 and 77 ; *Petaurista petaurista batavana*, No. E.J. 34 ; *Ratufa bicolor palliata*, No. E.J. 90 and 161.

The remainder of my collections has been sent to the Leyden Museum of Natural History, except a number of specimens presented to the Federated Malay States Museums.

that it can be compared with nothing else in Malaysia. In different parts of Sumatra the animal is called *têlêgu*. Curiously enough, it does not occur in the Padang Highlands.

#### 4. *Felis tigris sondaica* Fitzinger.

There has been some controversy over the question whether the Sumatran species ought to be separated from the Javan one. It is therefore interesting to mention the opinion of Mr. B. Ledeboer, the well-known tiger hunter.

I translate here some of the most important passages from one of his letters to me :

"The different kinds of tigers distinguished by the Javanese, (known as *gêmbol* and *tjantêl*) because of the shape of the stripes, are quite fictitious. The skins I possess from Java, Bali and Sumatra, more than one hundred, all show the same kind of stripes. The slight differences noticeable being due to age or mode of life. Tigers living in lalang fields are lighter in colour than those from the forest. Young tigers are different from old ones. The older the animal, the narrower and further apart the stripes will grow. In very old tigers the stripes on the front part of the body disappear altogether.

"The Sumatran tiger is marked quite differently from the Javan form. If a Sumatran tiger is laid on its back, nothing is seen but a whitish skin, the under-side of head, throat, breast and belly being totally without markings. In the Javan tiger, however, the extent of white on the under-surface is considerably reduced and encroached on by the ends of the stripes from the sides. An animal from Sumatra may therefore be distinguished at a glance from one from Java. Moreover the stripes in the Sumatran tiger are not so continuous, being frequently broken ; they even show a tendency to form spots, not plain ones, but circles. Full grown tigers from Java, Bali and Sumatra do not vary much in size. The biggest example I have obtained ran somewhat over 3 metres ; 3.05 metres is an exception. The males are much larger than the females."

[When Mr. H. C. Robinson and I wrote our note on Sondaic tigers (Journ. F.M.S. Mus. VIII, pt. 2, 1918, p. 8) we had to depend on literature for information and recorded a Sumatran specimen as *F. t. sondaica* though Schwarz had selected Java as the type-locality for that race. During my visit to Java in 1920 I saw a number of tiger skins from that island and from Bali and am now of opinion that *sondaica* must be used for the Javan animal only, for besides having the narrower white undersurface mentioned by Heer Ledeboer the stripes are undoubtedly less heavy than in the Sumatran animal. The Sumatran and Malayan material I have been able to compare is very small and I have not been able to see any difference between the animals of the island and the peninsula : both apparently are *F. t. tigris*.



The tiger of Bali, *F. t. balica* Schwarz (Ann. & Mag. Nat. Hist. (8) X, 1912, p. 325) seems to me to have still narrower and fewer stripes than the Javanese race (four Bali specimens examined). Schwarz, who only saw one skin, says the markings are broader and more duplicated! He also states that the Bali animal is recognisable by its smaller size. I think that size and skull characters are very untrustworthy guides for distinguishing Malaysian tigers: they depend so much on age as we have shown (l.c.s.) C. Boden Kloss].

##### 5. *Felis pardus* Linn.

It has sometimes been doubted whether the panther really occurs in Sumatra, but Mr. Boden Kloss drew my attention to a record of Schneider, who saw a black panther at Batu Bahra, and he himself knows of a second animal fired at, but missed in the Residency of Sumatra's East Coast some 15 years ago. I myself have been told several times of *black* panthers having been shot by Europeans, and native hunters informed me repeatedly that a black panther, which they called *kumbang* was known to them. In Java where the same name is applied to the melanistic variety of *Felis pardus*, it is much rarer than the normally coloured animal. I know, however, of no authentic record of a *Felis pardus* of the normal yellow colour with black markings having been obtained in Sumatra. Over and over again European hunters assured me that they had shot such an animal, but on closer investigation all these cases turned out to refer to *Felis nebulosa*, the "rimau dahan" of the Malays.

My opinion, that the normally coloured *Felis pardus* does not live in Sumatra is still unshaken, and I am very much inclined to believe that the black animals shot or seen in this country are nothing else than melanistic examples of *Felis nebulosa*. I may mention, that this is also the opinion of the well-known tiger hunter Mr. B. Ledeboer.

##### 6. *Lutra lutra* barang Cuv.

*Lutra vulgaris barang* Robinson & Kloss, Journ. F.M.S. Mus. VIII, pt. 11 (1918), p. 13.

1 ♂ (skin and skull) Fort de Kock, West coast of Sumatra, 920 metres (3,000 ft.), 15th June 1920, No. E.J. 404, leg. E. Jacobson.

Measurements in the flesh:—

Head and body, 557; tail, 470; hind foot, 109; ear, 19 mm.

Skull: greatest length, 104; condylo-basal length, 106; basal length, 98; palatal length, 47; greatest length on outer edge of *p.m.*<sup>4</sup>, 10·7; greatest diameter of *m*<sup>1</sup>, 10·7; interorbital breadth, 19; postorbital breadth, 14; cranial breadth, 48·5; mastoid breadth, 56; zygomatic breadth, 60·5 mm.

This specimen is now in the F.M.S. Museum at Kuala Lumpur.

[Though the best character for determining the species, *i.e.*, the shape of the upper edge of the rhinarium, has been destroyed by an injury to the nose I have no doubt as to my identification, made at Heer Jacobson's request, of this considerably grizzled specimen. C. Boden Kloss].

7. *Petaurista punctata sumatrana* Kloss (Plate III).

This specimen, which will be sent to the Leyden Museum, was bought from a native at Fort de Kock (940 metres), and must have been captured in the vicinity of this place, situated in the Padang Highlands (West coast of Sumatra). It had become rather tame and was kept in a cage. Being of nocturnal habits it slept mostly during the day, sitting hunched up in one of the corners of its cage, with its tail folded over its back and the end of it curled around its head in such a manner, that the latter was entirely concealed. If disturbed during the day it would wake up for some time and even take the food given to it, but later it would go to sleep again, becoming lively in the evening after the sun had set. A favorite position when awake was the one seen in the accompanying photograph, its tail being held over its back and head.

The *Petaurista* was fed with all sorts of fruit and nuts, the figs of different kinds of *Ficus* being very much preferred. I think I made a great mistake by feeding it exclusively on vegetable matter, as it is well-known that squirrels are great destroyers of birds nests, devouring eggs and young fledglings. The idea did not occur to me then to provide animal food, and to this reason I ascribe the fact that the *Petaurista* after some time began to gnaw its soles. After it had devoured a great part of the skin of its feet, I decided to kill the animal, fearing the specimen would be spoilt.

Afterwards I heard from one of my acquaintances, that he had kept a *Petaurista* in confinement, which devoured the greater part of one of its gliding membranes. The natives here assert that the *Petaurista*, which is called in Minangkabau Malay *kubin*<sup>1</sup>, destroys the very young coconuts, not bigger than a hen's egg, but the specimen I kept refused to touch these young nuts.

*Petaurista petaurista batuana* Miller, seems to be the common species in the Padang Highlands. When I once stopped at a village called Andalas at the foot of Mt. Sago, flying-squirrels used to come at dusk in a volplane from the surrounding hills down to the village in the valley, covering in one stretch a distance which must have been at least 400

<sup>1</sup>The name of *kubin* is equally applied to the flying Lemur *Galeopterus variegatus temmincki* (Waterh.). In Sumatra, perhaps, but in the Malay Peninsula this animal is called "kubong" (C.B.K.).



or 500 yards. They alighted always on the trunks of coconut trees, which being totally without branches afforded a convenient alighting spot. Then they crawled up the trunk till they came underneath the base of the crown and pushed off, alighting then on some other tree. The line of flight is always curved ; first slanting down and then curving up again : the point of arrival is, however, always lower than the starting point.

When in August 1915 I made an ascent of the Peak of Korinchi (Sumatra), I found a *Petaurista* on the highest point of the Peak, at the very brim of the crater. When I approached it stared at me with its large glaring eyes, making no attempt to escape.

I cannot explain what motive the animal had to seek such an inhospitable spot, which is 3,800 metres (12,500 ft.), high and, except for a few straggling plants, is for the last 400 metres entirely bare of all vegetation. The animal could not possibly have come to the mountain top through the air, for, as pointed out above, it has to avail itself always of a higher starting point. Therefore it must have crawled up all the way from the nearest forest, which is still considerably below the limit of vegetation.

This is not the only record of a *Petaurista* being found in such a peculiar place. Mr. L. Westenenk, now Resident of Palembang, told me that a *Petaurista* was formerly seen at the edge of the crater of Mt. Merapi in the Padang Highlands. The surroundings of this crater are also without vegetation.



E. JACOBSON, PHOTO.

PETAURISTA PUNCTATA SUMATRANA.





#### XIV. NOTES ON THE PROBABLE CLIMATE OF A MOUNTAIN STATION IN THE MALAY STATES.

By C. E. P. BROOKS, M.Sc., *Air Ministry.*

##### 1. Temperature.

The heat of tropical regions is proverbial, but they are characterised rather by constant heat than by unusually high temperatures. Taking Singapore as an example, and comparing it with Richmond, Surrey, we have the following little table :—

Temperature.	Singapore. Richmond.	
	°F.	°F.
Mean annual .. .. .	81	50
Hottest month .. .. .	82	63
Coldest month .. .. .	80	39
Annual range .. .. .	2	24
Mean daily maximum .. .. .	88	56
Mean daily minimum .. .. .	74	43
Highest recorded .. .. .	95	94
Lowest recorded .. .. .	70	9
Absolute range .. .. .	25	85
Average difference between mean temperature of one day and the next .. 1½ (Batavia) 4		

This table shows us at once the characteristics of an equatorial coast station as compared with London :

(1) The mean annual temperature is about 30 degrees higher. On all tropical coasts and islands the mean temperature at sea level stays very close to 80° F., a round number which is very convenient to remember.

(2) The annual variation is exceedingly small, being only 2° F. at Singapore. At stations so close to the equator (the latitude is only 1° 17' N.) it is more or less of an accident which months are the warmest. There is no distinction of seasons by temperature as there is in England, the terms "winter," "spring," etc., having no meaning. The sun is overhead at the equinoxes, *i.e.*, March and September, but the difference from other months is not great enough to be important.

(3) The daily range, or the difference between the temperature of the day and that of the night, is very nearly the same at Singapore and London, but even here there is a difference. In the tropics the day is always hotter than the night by about the same amount, and the alternation of higher and lower temperatures every 24 hours is as regular as is the alternation of summer and winter in temperate regions. In fact it has been said that "night is the winter of the tropics." In England on the other hand, though the day is *generally* warmer than the night, it sometimes happens, especially in winter, that the temperature rises as night comes on, so that the night is warmer than the day. In the tropics this never happens.



(4) But though the night is cooler than the day, it is still very hot, as judged by English standards.  $74^{\circ}$  F., which is the average temperature of the coldest part of the night at Singapore, would pass for a hot day in England.

(5) It is in the extremes of temperature that the difference between temperate and equatorial regions is shown most markedly. Days almost as hot as any met with in Singapore can be experienced in a London summer. At Bukit Mertajam, near Perak, a maximum temperature of  $101^{\circ}$  F. has been recorded, but this has been nearly equalled in England ( $100^{\circ}$  F.). On the other hand, the lowest temperature recorded at Singapore is  $70^{\circ}$  F., while at Richmond the thermometer has been down to  $9^{\circ}$  F., a difference of  $61^{\circ}$ .

(6) The smaller difference from one day to the next in the Tropics also makes for monotony.

## 2. The Change of Temperature with Height.

Leaving the sea-level and climbing the slopes of a mountain, the temperature is found to fall. This fall is on the average at the rate of about 3 degrees Fahr. for every thousand feet. Thus at a height of five thousand feet the mean temperature will have fallen from the tropical figure of  $80^{\circ}$  F. to the merely pleasantly warm one of  $65^{\circ}$  F. That is why it is always desirable in the tropics to establish health stations or sanatoria on high mountains, the change to the lower temperature having a marked bracing effect; the smaller density of the air owing to the decreased atmospheric pressure is also beneficial at moderate heights (not exceeding 6-7,000 ft.) as in the generally greater dryness of the air.

The diurnal range at high levels does not generally differ greatly from the average at lower levels, but much depends upon local conditions. On an elevated plateau the range is much greater than on the side of an isolated mountain peak, for two reasons. Firstly, a plateau offers a wider surface to direct heating by the sun's rays, and therefore gets much hotter during the day than a mountain slope. Secondly, on a level plateau the air becomes colder at night than on a mountain slope. Air, especially dry air, does not itself lose heat rapidly by radiation, but the ground beneath it does, and the air becomes cooled by contact with the ground. Consequently air near the ground becomes colder than that some distance away from the ground. Cold air is heavier than warmer air, consequently it will flow down a mountain slope like a river and give place to warmer air which has not been in contact with the ground. On a plateau it cannot flow away, but must remain where it is, so that the temperature falls lower.

This is illustrated by the conditions at two mountain stations in Java. One, on a level plateau enclosed by the Yang Mountains, at an elevation of 6,500 ft., has a daily

range of  $14^{\circ}$  F., from  $66^{\circ}$  F. in the day to  $52^{\circ}$  F. in the night; at the other, at Tosari on a mountain slope, at a height of 5,800 ft., the daily range is not more than  $7^{\circ}$  F.

At Tosari in Java the lowest temperature occurs just before sunrise, as near the sea coast, but the temperatures during the day at a height of about 5,800 ft. are very different. In the morning clouds form with their upper surface below the level of the station, and temperature rises rapidly, the station receiving not only the direct and very powerful radiation from the sun, but also that reflected from the clouds. But during the day, as the heat of the plains becomes greater, the level of the clouds rises, and shortly after ten o'clock they reach the station, which then becomes plunged in mist. Temperature now falls rapidly, but with great fluctuations of as much as  $5^{\circ}$  F. in a few minutes as the clouds come and go. Consequently the greatest heat of the day comes about ten o'clock in the morning, instead of in the afternoon as at lower levels. The afternoons are cloudier and cooler.

As a rule, at night the clouds either disperse or sink to a lower level, so that the nights are clear and dry, but occasionally they will be cloudy and these nights will be relatively hot and oppressively moist, the blanket of cloud preventing the ground from radiating its heat.

### 3. Humidity, Sunshine and Cloudiness.

The chief characteristic of the humidity of the air at a tropical mountain station is the rapidity with which it varies. Above the clouds the air is very dry, but among them it is saturated with moisture. In the intense solar radiation of the morning the air is as dry as that of a desert at noon; a cloud drifts up, and even though no rain falls, everything drips with moisture. The actual average depends upon local conditions, but will probably be not far from eighty per cent. of saturation during the days—a figure indicating a quite considerable degree of moisture, and much less during the nights, which would thus appear cooler than they actually are relatively to the plains.

The amount of bright sunshine will probably be very considerable. At low level stations the sky is on the average half covered with clouds, which means that on the average sunny and dull days will occur with equal frequency, but at a level of 5,000 ft. much of the cloud development will take place below the station, which will thus receive a greater amount of sunshine, especially in the mornings. Moreover, owing to the greater clearness of the air, this sunshine will be far more powerful than on the plains. Excess of sunshine and light is frequently dangerous to Europeans in the tropics.

### 4. Winds : The Alternation of Monsoons.

But if there are not four seasons in the English sense, there is a very definite division of the year into two seasons



of another type, known as the north-east and south-west monsoons. From December to March the wind blows very regularly from the north-east, and from May to October it blows almost equally regularly from between south-east and south-west. April and November are transition months.

To understand this change we must consider the geographical position of Singapore. To the north lies the great continent of Asia, to the south the large island of Australia. These are far enough north and south to be greatly cooled in winter and to a less extent heated in summer. Lying in opposite hemispheres, Asia is hot while Australia is cold, and *vice versa*. The equatorial regions are always hot. Now air expands with heat, and hot air is lighter than cold air, consequently hot air tends to rise while the cold air flows along the surface of the earth to replace it. In the months of November to March this cold air flows in a steady stream of immense volume from the high table lands of central Asia, where it is winter, across the intervening oceans to the equator and possibly beyond it. This is the north-east monsoon, which returns every year at about the same time. In some parts of the world it blows with great force, but at Singapore it is relatively light, blowing at only about two miles an hour a few feet from the ground.

From May to October it is Australia that is relatively cold, and the wind at Singapore during these months is away from this continent, *i.e.* is southerly, blowing from between south-west and south-east at about two miles an hour. At this sheltered locality calms are frequent but in a more exposed situation calms are rarer and the velocity of the wind somewhat greater. Wind generally increases in velocity with height, and on a mountain slope there is probably a fairly steady breeze which is a favourable factor in the climate. The alternation of monsoons at the level of 5,000 ft. is probably the same as at Singapore, but at greater heights the wind would come very regularly from east.

##### 5. Rainfall.

The rainfall in the Straits Settlements is everywhere heavy, Singapore having one hundred inches (2,500 millimetres) a year and Perak as much as 120 inches (3,000 mm.). Whether the rainfall at a mountain station of 5,000 ft. height would be more or less than this depends very much on local conditions, probably it would be rather less, as the heaviest rain clouds often have their under surfaces below 5,000 ft. At still greater heights the amount falls off rapidly. A total of one hundred inches is several times as heavy as that of London, but it must be remembered that owing to the extremely rapid rate at which rain falls in the tropics, the actual time taken is very much less. The intensity of tropical rainfall is only rarely attained in



England, in exceptionally heavy thunderstorms. The cause of this heavy rainfall is the great amount of moisture in the air. Saturated air at 80° F. contains twice as much moisture as the same volume of saturated air at 60° F., and nearly four times as much as at 40° F. It is by the elevation of air and its consequent cooling that clouds and rain are formed. If saturated air is cooled from 80° F. to 60° F. it will set free twice as much water, that is, the rain will be twice as heavy, as if it were cooled from 60° F. to 40° F. The number of days—173—at Singapore is almost the same as at Richmond (170), and in Perak, although the total fall is greater, the average number of days is only 156. A “rain-day” is defined as a day on which a measurable amount of rain, generally 0·01 inch or more falls.

There is some attempt at the development of a rainy season in the Straits Settlements, but it differs in different parts. At Singapore the rainiest months are November to January, and the least rainy—one can hardly call them dry—May to September. In Perak September to November are the rainiest months, January and February the least rainy. Even the relatively dry months however exceed six inches (160 mm.) in their rainfall, a total representing an unusually wet month in England.

Some of the individual falls are exceedingly heavy, Singapore having experienced more than 7 inches (175 mm.) in a day on at least two occasions, while Perak has reached the total of 13·8 inches (346 mm.) in 24 hours. But at a mountain station we may expect the falls to be less heavy and more continuous.

There is one point in which mountain climates in the tropics are unfavourably situated, and that in the unequal division of the rainfall between the day and the night, owing to the daily variation in the level of the clouds. Tosari, the health resort of Java previously referred to, has an annual rainfall during the day of about four times as much as that during the night, and this peculiarity is probably shared by other mountain stations in the tropics of a similar height.

## 6. Storms.

Tosari is very subject to severe storms from the southwest, but these are local only, being due to the peculiar nature of the topography of East Java, where a long funnel-shaped valley conducts the winds with accumulated force straight to the settlement. An open isolated peak should be much better situated in this respect, and should rarely experience more than a strong brecze.



## XV. THE FLORA OF KLANG GATES, SELANGOR.

By H. N. RIDLEY, M.A., C.M.G., F.R.S.

The high ridge of Klang Gates in Selangor consists of a lofty dyke of quartzite running across the valley of the Klang river which has cut its way through the rock. The ridge is about three miles in length, and its highest point is 1,400 feet in height. In many places the top is quite narrow, only a few feet across, and the sides are in most places quite precipitous. It is evidently a quartzite dyke traversing granitic rocks which have long since been eroded away. I visited it many years ago and collected there a portion of the peculiar flora on a part of the ridge to the north above the bungalow, which stands high up above the road; and on the 2nd January, 1921, with Mr. C. Boden Kloss and Messrs. Milsum and South of the Agricultural Department ascended the ridge on the south side to Bukit Lompat Bayan, 1,148 feet altitude. On the previous day Mr. Kloss and I had ascended the north side above the bungalow, for some way, and later Mr. Kloss went further up towards Bukit Batu Tabur, the highest point, 1,445 feet high. On the lower slopes the lowland flora has ascended for some distance, where there is sufficient soil and humidity for its growth, but on the bare quartzite ridge there is a small but quite peculiar flora consisting of several endemic species with several only known from much higher altitudes in our mountains, and not occurring in the forest-clad hills of the main chain. These plants are strictly xerophytic and, as I shall hope to show in a later paper, are the remains of an ancient xerophytic flora which at one time pervaded the whole of the Malay Peninsula, but which by climatic changes has been driven out, only persisting on the sub-xerophytic tops of certain of our mountains and to some extent on the seashores.

To reach the summit of the ridge on the south side we crossed the river and passed through a portion of a rubber plantation, above which is a wooded slope consisting of lowland trees and shrubs in which we found the new and beautiful *Didymocarpus primulinus*. This slope of deep humus leads to a break in the precipitous quartzite ridge by which it is possible to get on to the top at Bukit Lompat Bayan, which is quite bare of soil and bears the remarkable rock flora. It is this flora of which I treat in this paper, but have added two new species growing lower down and towards the base of the rock.

*Capparis larutensis*, King. (*Capparidaceae*).

A single bush of this very thorny plant occurred on the rocks behind the bungalow. Only previously known from Perak.



*Elaeocarpus Mastersii*, King. (Tiliaceae).

A small bushy tree, the leaves are rather small and more coriaceous than in the typical lowland form. Common in open country in the Peninsula.

*Rhodoleia Teysmanni*, Miq. (Hamamelideae).

This beautiful bush with its heads of rose-pink flowers is abundant on the rocks on both sides of the ridge. It is a high mountain plant occurring on the dryer mountains at 3,000 to 5,000 feet altitude. I have never seen it at such a low altitude elsewhere.

*Pygeum Hookerianum*, King. (Rosaceae).

The bush here has smaller and narrower leaves than usual. Not rare in the low country.

*Carallia euryoides*, Ridl. Flora Mal. Pen. 1, 1922, p. 698. (Legnotidae).

A small tree, branches slender, black with prominent nodes, leafy at the top only. Leaves coriaceous, elliptic acuminate with a long blunt point, base cuneate, edge serrulate, 1.75 in. long, .5 in. wide; nerves 7 pairs strongly inarching, hardly invisible above; petiole .25 in. long. Cymes axillary, .25 in. long, of 3 flowers, or compound of 3 branches with 2 flowers on each; pedicels .1 in. long. Flowers .12 in. long. Calyx urn-shaped with 5 coriaceous lanceolate acute lobes. Petals very narrow linear 5, as long as the sepals. Stamens 10, the outer series slightly longer than the inner row, about as long as the sepals, the filaments rather thick; anthers elliptic. Style stout as long as the sepals; stigma rather large pulvinate. Fruit small, ovoid with the persistent triangular lanceolate sepals. On rocks about 1,000 feet altitude. Not common. Allied to *C. Scortechinii* King, and *montana* Ridl., but the leaves are entirely different with the general appearance of those of *Eurya acuminata*. This set of *Carallias* is typically montane and very distinct from the much larger leaved lowland species which also have larger cymes.

*Boeckea frutescens*. (Myrtaceae).

Perhaps the most abundant and conspicuous shrub on the rocks. This plant is typically a high mountain plant of the dryer mountains such as Gunong Tahan, Mount Ophir and Kedah Peak at 3 to 4,000 feet altitude and is absent from the wetter mountain forests of the main chain<sup>1</sup> and from Penang. Its occurrence on Klang

1. It occurs freely on Gunong Terbakar near Gunong Berumban in the main range, Perak-Pahang boundary, where there is a heavy rainfall, H.C.R.

Gates is very remarkable. It is reported also as a seashore plant in Borneo and Tréngganu<sup>1</sup>.

*Anplectrum divaricatum*, Triana. (*Melastomaceae*).

In the lower country a long climber, but here I found some in the form of a bush.

*Sonerila prostrata*, Ridl. *Flora Mal. Pen.* 1, 1922, p. 782.

A very slender, creeping, prostrate plant, stems filiform, several inches long, hairy red. Leaves in equal pairs, .5 in. apart, ovate hairy above with sparse white hairs, tip rounded, base round or shortly narrowed, edge serrate .25 in. long and wide; petiole slender, 1 in. long. Flowers 2 on very slender terminal peduncles; pedicels very short. Calyx urn-shaped narrowed upwards with short acute teeth, hairy, .12 in. long. Corolla bright pink, .25 in. wide. Petals 3 or 4, obovate, minutely apiculate. Stamens 3, nearly as long as petals; anthers yellow. Style slightly shorter. Capsule flask-shaped, smooth, nearly truncate with very short points, .25 in. long.

On shady rocks at the entrance of the tunnel on the road at Klang Gates forming a small mat of stems. This charming plant is utterly unlike any species of the genus known to me in its prostrate creeping stems and very small star-like flowers. It is, however, I think most nearly allied to the slender-stemmed erect group with smooth fruit, of which *S. tenuifolia* is an example.

*Aleisanthia rupestris*, Ridl. (*Rubiaceae*).

This is common especially on the rocks above the bungalow and Klang Gates is its only known habitat. The only other known species is *A. sylvestris* Ridl., from rather dry wooded hills at Kuala Lebir in Kelantan, a tall shrub. *A. rupestris* is a dwarf shrub barely 12 in. tall with yellow flowers.

*Embelia coriacea*, Wall. (*Myrsineae*).

A climber with large stiff leaves and big panicles of small white flowers. It occurs all over the Peninsula from Singapore to Penang and in Java, Sumatra and Borneo.

*Vaccinium eburneum*, Ridl. (*Vacciniaceae*).

A very fine bush, or almost a tree, with abundance of pure white flowers. Also occurs on Kedah Peak.

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1. It is also abundant in Lower Siam north of Patelung, almost at sea level. Great stretches of it can be seen from the railway. H.C.R.



*Rhododendron longiflorum*, Lindl. (Ericaceae).

A beautiful bush *Rhododendron* with bright red flowers. On the rocks on both ends of the ridge. It occurs also in Perak and formerly in Singapore as an epiphyte on high trees, and in Borneo and Sumatra.

*Fagraea auriculata*, Jack. (Loganiaceae).

A single plant on rocks behind the bungalow. Not in flower, I saw it there on my first visit. This plant usually starts life as an epiphyte and eventually by killing its host becomes a tree. It also grows on rocks. Scattered over much of the Peninsula and the Malay Isles.

*Didymocarpus primulinus*, Ridl. sp. nov. (Cyrtandraceae).

A herb with a short, closely hairy stem about 1 to 4 inches long. Leaves about 6, elliptic, round at tip, base round or shortly narrowed, above glabrous, beneath softly densely hairy, edge thickly hairy; nerves 8 pairs, distinct, 4.5 in. long, 2.75 in. wide; petiole 1 to 2 in. long, thick, densely hairy. Scapes very numerous, erect, slender from upper axils one-flowered, 2 in. long, hairy. Calyxlobes linear acuminate, .2 in. long. Corolla-tube .5 in. long, limb .4 in. long, unequally bilobed, upper lobes oblong, blunt, .2 in. long, lower lip much longer .4 in. long with 3 broad rounded oblong lobes .25 in. wide. All primrose yellow with an orange patch in the mouth. Stamens 2, filaments slender, curved as long as the tube, anthers elliptic connivent. Capsule slender, 1.5 in. long, acuminate, glabrous when ripe.

In woods on the slope leading to Bukit Lompat Bayan. This pretty plant seems to me to be most nearly allied to *D. longipes* Hook. of Mt. Ophir.

*Trema angustifolium*, Bl. (Urticaceae).

Shrub about 4 feet tall. A clump of this on the bare rock on Bukit Lompat Bayan. *Distrib.* Malacca, Penang, Sumatra.

*Ficus nidica*, L.

Tree on the high ridge above the bungalow collected by Mr. Kloss on his second visit. Common in the Peninsula.

*Ficus diversifolia*, Bl. var. *Kunstleri*.

On the ridge behind the bungalow (C. B. Kloss) usually an epiphyte and as such on lofty trees common in the Peninsula.



*Ficus diversifolia*, var. *ovoidea*.

A number of bushes on rocks behind the bungalow. This is usually a seashore form: it is quite erect and terrestrial.

*Choriophyllum malayanum*, Benth. (*Euphorbiaceae*).

A bushy tree with dark green leaves and greenish-white flowers. On rocks behind the bungalow, a male tree. A mountain plant and almost the only plant in the order which ascends above 2,000 feet.

*Eriachne pallescens*, Br. (*Gramineae*).

On rocks near the bungalow, common here. Not rare in rocky and sandy spots especially near the sea, Singapore, Selangor, Ginting Bidai, Pahang. *Distrib.* Chittagong, Nicobars, Cochin-China, China, Borneo and Australia.

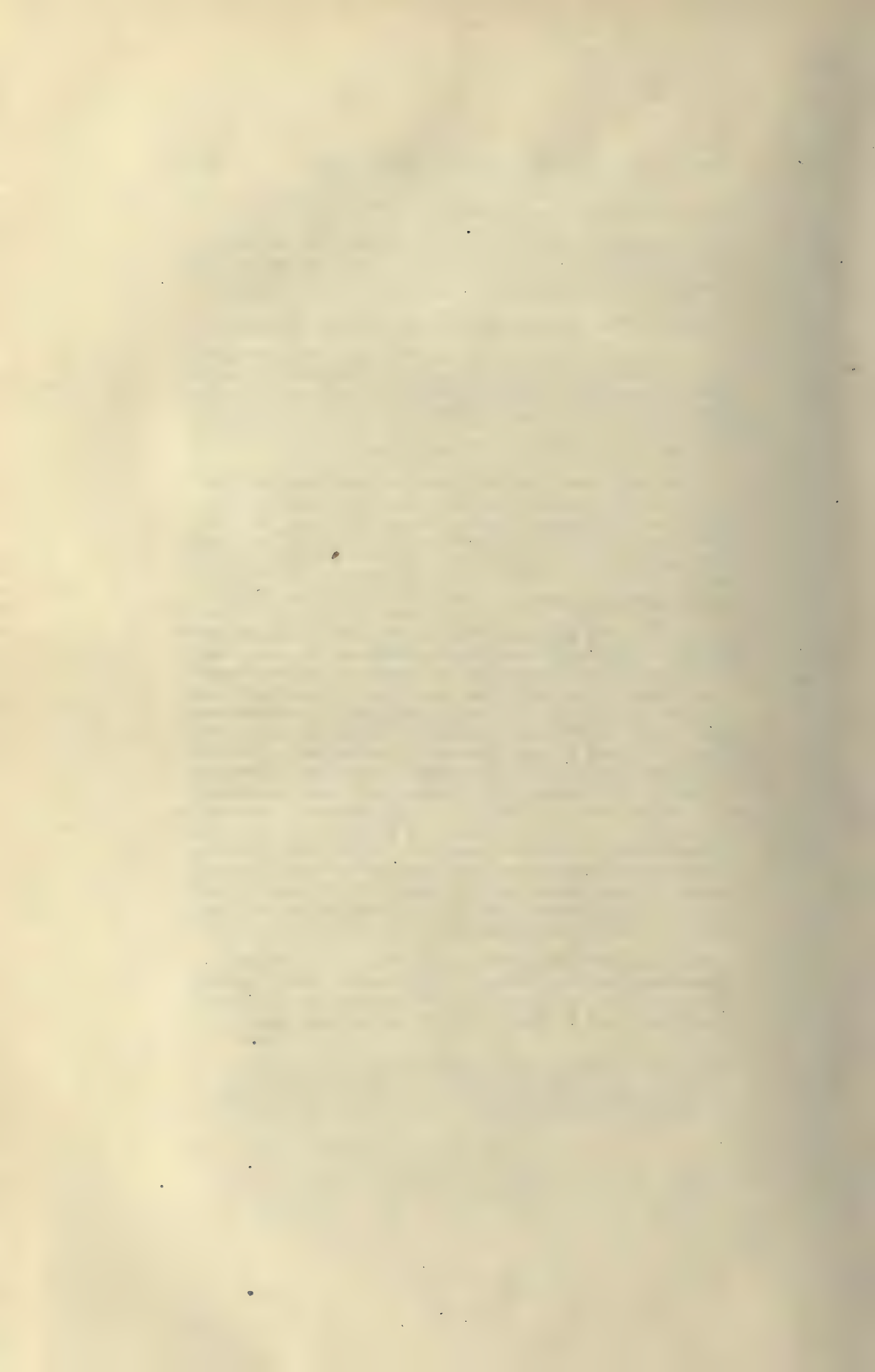
*Eulalia Milsumi*, Ridl. sp. nov.

A grass forming clumps about 2 feet tall; stems slender often simply branched, glabrous. Leaves sub-distichous, very narrow linear acuminate, rather rigid, 2 in. long, .2 in. wide or narrower, broadened and truncate at base with a central midrib fairly conspicuous; ligule none. Spikes one to four, 1.5 in. long with a few distant reduced leaves. Rachis of spike terete fringed with white silky hairs, joints tufted silky white. Spikelets 1-stalked and 1-sessile, the stalked one articulate on a silky fringed stalk. Glumes 1 to III lanceolate narrow, white hairy, awned from below tip, II is very narrow, III rather broader. Valve (Glume IV) very short, glabrous hyaline bifid, lobes acuminate, awn .5 in. long, turning brown at base, white above. Stamens 3; anthers yellow, oblong. Style plumed, buff. On the bare rocks at Klang Gates on Bukit Lompat Bayan.

A very distinct species of this genus which is represented in the Malay Peninsula by three species *E. lanipes* Ridl., of Kedah Peak, *E. praemorsa* (*Polytrias praemorsa*) and *E. Ridleyi*, Stapf: a sand-hill plant.

*Cibotium Barometz*, Link. (*Filices*).

Rocks above the bungalow. Local on dry hills in the Malay Peninsula, Sumatra, Burma, Assam.



XVI. BIRDS FROM THE ONE FATHOM BANK  
LIGHTHOUSE, STRAITS OF MALACCA,  
*November, 1918 and November and December, 1919,*  
*by*

H. C. ROBINSON AND C. BODEN KLOSS.

The One Fathom Bank Lighthouse is an erection on a submerged bank in the middle of the Straits of Malacca about fifteen miles distant from Pulau Pintu Gedong, the nearest point of the Selangor Coast and about 26 miles from the Aroa Islands towards the Sumatran coast, whence a collection has already been reported on (Journ. Fed. Malay States Mus. ii, pp 8-14 (1906)). This collection was made during November and is very similar in character.

The present list adds two birds to the Fauna of the Malay Peninsula, viz:—

*Chelidon dasypus* (Bp.)

*Oceanodroma monorhis* (Swinh.)

while several species only rarely met with on the mainland were found in abundance.

With very few exceptions all the specimens were either killed against the light or captured while fluttering around it. Species which were obtained on the Aroa Islands are marked with an asterisk.

1. *Treron nipalensis*, Hodgs. 1 ♂, 2 ♀
- \*2. *Ptilinopus jambu* (Gm.). 6 ♂, 5 ♀
3. *Rallina fasciata* (Raffles). 6 ♂, 11 ♀
4. *Rallina superciliaris* (Eyton). 1 ♂, 3 ♀
- \*5. *Amaurornis phoenicura chinensis* (Bodd.). 1 ♂, 1 ♀
- \*6. *Sterna aenetheta*, Scop. 1 ♂, 2 ♀
7. *Sterna fluviatilis tibetana*, Saunders. 1 ♂
8. *Sterna* (?) *sinensis*, Gm. 2 ♀

The identification of these small terns in immature and winter plumage is a somewhat uncertain matter.

9. *Oceanodroma monorhis* (Swinh.). 1 ♂
10. *Terekia cinerea* (Guldenst). 1 ♂
11. *Limonites subminuita* (Middendorf). 1 ♀
12. *Gallinago sthenura* (Kuhl). 1 ♂
13. *Butorides javanica javanica* (Horsf.). 1 ♂



- \*14. *Dupetor flavicollis* (Lath.). 1 ♂, 4 ♀
- 15. *Ardetta sinensis* (Gm.). 1 ♂, 1 ♀
- \*16. *Sula sula* (Linn.). 1 ♂
- \*17. *Accipiter virgatus gularis*, Temm. & Schleg. 1 ♀
- \*18. *Otus scops malayana* (Hay). 1 ♀  
More rufous than the majority of specimens.
- \*19. *Ninox scutulata scutulata* (Raffles). 1 ♀  
Wing 211 mm.
- \*20. *Halcyon coromandus coromandus* (Lath.). 3 ♂, 3 ♀
- \*21. *Halcyon pileatus* (Bodd.). 1 ♂
- \*22. *Ceyx tridactyla* (Pall.). 10 ♂, 2 ♀
- 23. *Eurystomus orientalis orientalis* (Linn.). 1 ♀
- \*24. *Caprimulgus indicus jotaka*, Temm. & Schleg. 1 ♂
- 25. *Collocalia innominata*, Hume. 2 ♂, 1 ♀
- \*26. *Coccyzus coromandus* (Linn.). 1 ♀
- \*27. *Surniculus lugubris dicruroides*, Hodgs. 1 ♂, 7 ♀  
Decidedly this form with the wing in all cases over 135 mm.
- \*28. *Hierococcyx fugax nasicolor* (Hodgs.). 3 ♂, 1 ♀
- \*29. *Cuculus micropterus*, Gould. 1 ♂
- \*30. *Pitta cyanoptera*, Temm. 11 ♂, 10 ♀
- \*31. *Pitta cucullata*, Hartl. 1 ♂, 10 ♀
- 32. *Hemichelidon sibirica fuliginosa*, Hodgs. 7 ♂, 2 ♀
- \*34. *Alseonax latirostris* (Raffles). 3 ♂
- 35. *Zanthopygia xanthopygia* (Hay). 2 ♀
- 36. *Cyanoptila cyanomelana cumatilis*, Thayer and Bangs. 1 ♂
- 37. *Poliomyias mugimaki* (Temm.). 5 ♂, 1 ♀
- 38. *Terpsiphone paradisi incii* (Gould). 1 ♀
- 39. *Terpsiphone atrocaudata* (Eyton). 1 ♂, 1 ♀
- 40. *Rhinomyias tardus*, Robinson & Kloss. 2 ♂, 1 ♀  
Very doubtfully distinct from *Rhinomyias nicobarica*, Richmond.
- 41. *Pericrocotus cinereus*, Lafr. 3 ♂, 2 ♀
- 42. *Cichloselys sibirica davisoni*, Hume. 12 ♂, 12 ♀
- \*43. *Turdus obscurus* (Gm.). 1 ♂, 1 ♀

- \*44. *Larvivora cyanea* (Pall.). 6 ♀
- \*45. *Locustellata lanceolata* (Temm.). 5 ♂, 9 ♀
- 46. *Locustella certhiola* (Pall.). 1 ♂, 1 ♀
- 47. *Acrocephalus orientalis*, Temm. & Schleg. 3 ♀
- 48. *Phylloscopus borealis borealis* (Blas.). 7 ♂, 4 ♀
- 49. *Lanius cristatus*, Linn. 3 ♂, 1 ♀
- 50. *Lanius tigrinus*, Drap. 1 ♂ imm.
- 51. *Chelidon dasypus* (Bp.). 1 ♀

The occurrence of this rare martin, which breeds in Japan and has been met with on migration in Borneo whence it was originally described, is rather surprising. The single specimen appears perfectly typical.

## XVII. A LIST OF BIRDS COLLECTED ON PULAU RUMPIA, SEMBILAN ISLANDS,

*In November and December, 1918*

*by*

H. C. ROBINSON AND C. BODEN KLOSS.

The following list of birds collected by Mr. E. Seimund on Pulau Rumpia, one of the Sembilan Islands off the mouth of the Perak River, in November and December, 1918 is of interest as bearing on migration and migration routes in the Malayan region, regarding which we have as yet very little exact knowledge.

One bird, new to the Fauna of the Malay Peninsula, was obtained:

*Oreocincla dauma* (Lath.)

Pulau Rumpia is a rocky island rising to a height of about 600 feet and of very uneven surface. In extent it is perhaps 1,500 or 2,000 acres and is densely forested. There are two or three small bays with sandy beaches of no great extent. It is the largest of the Sembilan Group and is separated from the other islands and from the mainland by depths approximating to twenty-five fathoms.

Except during the migration season the bird population is small, being confined to a few nutmeg-pigeon, crows, sunbirds and an occasional kingfisher, excluding of course the usual shore and marine birds.

1. *Treron nipalensis*, Hodgs. 1 ♂

2. *Ptilinopus jambu* (Gm.). 2♂, 4♀

Of highly migratory habits and found fighting at night in many very diverse localities, such as Government House, Singapore, and the Semangko Pass, Selangor-Pahang boundary.

3. *Myristicivora bicolor* (Scop.). 5♂, 1♀

Common on all the islands more or less throughout the year but rarely if ever found away from the coastal mangrove belt on the mainland.

4. *Chalcophaps indica* (Linn.). 2♂

Probably resident on the island in small numbers throughout the year.

5. *Caloenas nicobarica* (Linn.). 1♂, 2♀

Possibly resident, though we have never found it in the summer months.

6. *Tringoides hypoleucus* (Linn.).

Found throughout the year.

7. *Rallina superciliaris* (Eyton). 1♂

This rail and its congener *R. fasciata* are both very wandering species.

8. *Demiegretta sacra* (Gm.). 1♀

9. *Gorsachius melanolophus* (Raffles). 1♂

10. *Dupetor flavicollis* (Lath.). 1♀

Both migratory birds of highly nocturnal habits.

11. *Astur soloensis* (Lath.). 1♂ imm.

A rare bird in the Malay Peninsula; most of our specimens have been obtained in the autumn or winter months and it is doubtful if it is a resident.

12. *Astur badius poliopsis* (Hume). 1♀ imm.

An immature female in process of change to the adult plumage.

Also a migratory bird in the south of the Peninsula, though not improbably resident in the northern parts.

13. *Accipiter virgatus gularis*, Temm. & Schleg. 3♂ imm, 10♀ imm.

Also a very common migrant to the Malay Peninsula, but keeping mainly to the coasts. Other than immature birds in the striped plumage are hardly ever met with.

14. *Eurystomus orientalis orientalis* (Linn.). 3♂, 1♀



15. *Eurystomus orientalis calonyx*, Sharpe. 1 ♀

With Stuart Baker we are beginning to have our doubts as to the separability of these forms.

16. *Alcedo atthis bengalensis*, Gm. 1 ♂

Resident.

17. *Ceyx tridactyla* (Pall.). 1 ♀

A visitor; but not a migrant in the true sense.

18. *Halcyon pileata* (Bodd.). 1 ♂

19. *Halcyon chloris humii*, Sharpe. 1 ♂ imm.

Casual visitors.

20. *Caprimulgus indica jotaka*, Temm. & Schleg. 1 ♂, 1 ♀

Common throughout the Peninsula in the winter months.

21. *Cuculus micropterus*, Gould. 1 ♀

22. *Hierococcyx fugax nasicolor* (Hodgs.). 2 ♀ imm.

Only met with in the Peninsula in winter.

23. *Eudynamis scolopacea malayana*, Cab. 5 ♂, 11 ♀

Probably partially resident but the numbers are much augmented in the winter months.

24. *Surniculus lugubris*, *subsp.* ? 2 ♂, 2 ♀

It is difficult to decide whether these cuckoos should be referred to *S. l. dicruraoides* Hodgs., the northern race or *S. l. brachyurus*, Stresemann, the southern form described from Pahang. In size they are intermediate, having a wing of from 131-136 mm.

25. *Pitta cyanoptera*, Temm. 1 ♀

Performs migrations of limited extent.

26. *Hemichelidon sibirica fuliginosa*, Hodgs. 2 ♂, 3 ♀

27. *Hemichelidon ferruginea*, Hodgs. 2 ♂

A bird of passage merely, on the coasts and at low elevations in the Malay Peninsula. Probably resident during the winter months in the higher mountains.

28. *Muscitrea grisola grisola* (Blyth). 1 ♀

Probably resident.

29. *Poliomyias mugimaki* (Temm.). 5 ♂, 15 ♀

Migratory.

30. *Terpsiphone incii* (Gould). 1 ♂

Migratory.

31. *Cyanoptila cyanomelana cumatilis*, Thayer and Bangs. 1 ♀

*Cyanoptila cumatilis*, Thayer & Bangs, Bull. Mus. Comp. Zool. Harvard, III, 1909, p. 131 (Hupeh, China).

Our specimens from the Malay Peninsula conform to the description of Thayer and Bangs. It is doubtful however if they represent other than a non-breeding plumage of the true *C. cyanomelana* (Temm.) from Japan and it has yet to be shown that *C. bella* (Hay) described from Hongkong does not apply to the second form, the throat being described as "dull blue black."

32. *Pericrocotus cinereus*, Lafr. 1 ♂  
Migratory.

33. *Cichloselys sibirica davisoni*, Hume. 2 ♂ imm.,  
3 ♀ imm.

These birds are all very immature, but the Malayan race is probably that described by Hume from Muleyit if *Geocichla inframarginata* from the Andamans, described by Blyth in 1860, is not the same form.

34. *Turdus obscurus* (Gm.). 6 ♂, 5 ♀

A bird of passage in the low country.

35. *Oreocincla dauma* (Lath.). 1 ♀

A single bird shot on the 29th November, 1918, agrees precisely with *Oreocincla dauma*, which has not been recorded from further south than Central Tenasserim. It is not *O. affinis* Richmond, from the mountains of Peninsular Siam, with which we have compared it, that species having fourteen and not twelve tail feathers. Wing, 142 mm.

36. *Locustella lanceolata* (Temm.). 3 ♂

Resident and common in the Malay Peninsula during the winter months.

37. *Phylloscopus borealis borealis* (Blas.). 3 ♂, 2 ♀

Common in the Malay Peninsula. All this series are the true *A. b. borealis* with the smaller first primary and not *A. b. xanthdryas*, with the larger first primary extending well beyond the coverts, which is occasionally met with.

38. *Phylloscopus inornatus inornatus* (Blyth). 1 ♂

*Reguloides humei praeium*, Mathews and Iredale Austral. Av. Record iii, p. 45, 1919.

This is the bird hitherto known as *Acanthopneuste superciliosus* (Gm.)\*. The present example is the most southerly recorded; we have it also from Taiping.

\* Cf. Ticehurst, Ibis, 1922, p. 147.

39. *Aplonis panayensis strigatus* (Horsf.). 1 ♀

Accidental on Pulau Rumpia.

40. *Motacilla boarula melanope*, Pall. 1 ♀

A few are generally to be met with on Pulau Rumpia in the winter months. From Pulau Lalang, distant two or three miles from P. Rumpia, we have a specimen of *M. flava simillima*, Hartert, shot on 15th October, 1911. This species is very rare in the Malay Peninsula.

41. *Cyrtostomus ornatus ornatus* (Less.). 2 ♂

Fairly common throughout the year. This is the bird hitherto known as *Arechnechthra pectoralis* (Horsf.).

XVIII. LIST OF BIRDS COLLECTED ON PULAU  
JARAK, STRAITS OF MALACCA,

*In November, 1919,*

*by*

H. C. ROBINSON AND C. BODEN KLOSS.

For comparison with the birds collected on Pulau Rumpia a collection was also made on Pulau Jarak, Straits of Malacca, in November, 1919. Pulau Jarak is a small island, about three hundred acres in extent, rising steeply from the sea to a height of 600 feet. It is densely covered with vegetation and has no beaches and is entirely uninhabited.

Large numbers of a peculiar rat (*Rattus rattus jarak*, Bonhote) are found on it and a slightly differentiated form of a widely spread fruit bat (*Pteropus hypomelanus fretensis*, Kloss). As might be expected the birds obtained are not materially different from those on Pulau Rumpia from which island Pulau Jarak is distant about 34 miles almost due west, the maximum depth of the intervening sea being about 30 fathoms.

*List.*

1. *Myristicivora bicolor* (Scop.). 2 ♂
2. *Caloenas nicobarica* (Linn.). 1 ♂, 1 ♀
3. *Amaurornis phaenicura chinensis* (Bodd.). 1 ♂, 3 ♀
4. *Butorides javanica javanica* (Horsf.). 2 ♂, 1 ♀
5. *Dupetor flavicollis* (Lath.). 1 ♂, 2 ♀
6. *Demiegretta sacra* (Gm.). 1 ♀
7. *Gorsachius melanolophus* (Raffles). 2 ♂, 2 ♀



8. *Anous stolidus pileatus* (Bodd.). 1 ♂

The black noddy is extremely rare in the Straits of Malacca and this is only the second specimen on record.

9. *Sterna fluviatilis tibetana*, Saunders.

We are inclined to refer the terns of this type obtained in the Straits of Malacca in winter to this race of the Common tern and not to the Kamchatkan, *Sterna longipennis* Nordman, as has been done by many authors.

10. *Accipiter virgatus gularis*, Temm. & Schleg. 3 ♂, 6 ♀  
All these specimens are immature.11. *Astur soloensis* (Horsf.). 1 ♂  
A very nearly adult male.12. *Otus scops malayana* (Hay). 1 ♂  
A moderately rufescent bird.13. *Ninox scutulata scutulata* (Raffles). 2 ♂, 4 ♀  
All belonging to the migratory form with the wing over 210 mm.14. *Halcyon coromandus coromandus* (Lath.). 6 ♂, 3 ♀.15. *Halcyon pileatus* (Bodd.). 2 ♂16. *Caprimulgus indicus jotaka*, Temm. & Schleg. 1 ♀17. *Eudynamis scolopacea malayana*, Cab. 2 ♂18. *Cuculus micropterus*, Gould. 1 ♀19. *Pitta cyanoptera*, Temm. 1 ♂20. *Alseonax latirostris* (Raffles). 2 ♂21. *Hemichelidon ferruginea*, Hodgs. 1 ♂, 1 ♀22. *Cyanoptila cyanomelana cumatilis*, Thayer and Bangs. 1 ♂23. *Terpsiphone atrocaudata*, Eyton. 2 ♂ imm.  
*Terpsiphone princeps*, auct.

Two immature specimens. The bird is very rare, or only makes a very brief stay in the Malay Peninsula, whence we have only three other specimens.

24. *Monticola solitarius philippinensis* (Mull.). 1 ♀25. *Cichloselys sibirica davisoni* (Hume). 9 ♂, 5 ♀  
Adults are very typical *C. s. davisoni*.26. *Larvivora cyanea* (Pall.). 3 ♂27. *Locustella lanceolata* (Temm.). 4 ♂, 2 ♀28. *Phylloscopus borealis borealis* (Blas.). 6 ♂, 2 ♀29. *Dicrurus annectens*, Hodgs. 7 ♂, 1 ♀  
Quite typical.

XIX. THREE NEW ORIENTAL BIRDS.

By H. C. ROBINSON AND C. BODEN KLOSS.

*Otus luciae siamensis*, subsp. nov.

*Heteroscops vulpes*, Robinson, Journ. Fed. Malay States Mus. v, 1914, p. 91 (Bandon); Gyldenstolpe, Ibis, 1920, p. 752.

*Otus luciae*, Robinson & Kloss, Journ. Nat. Hist. Soc. Siam, V., 1922, p. 111.

A very rufous form of *Otus luciae* (Sharpe). The black markings on the crown, nape and tail much reduced and the spots on the back obsolete: wings and tail strongly washed with rufous, the outer webs of the wing feathers scarcely blackened, the pale wing bars much obscured. The undersurface paler and the spots and vermiculations obsolete. Differs similarly, but to a less degree, from *O. vulpes*, Grant, from Gunong Tahan, 5,000 feet, Pahang. We are not prepared to accept *vulpes* as different from the Kinabalu bird.

Type. Adult female from Kao Nong, Bandon, 3,500 feet, Peninsular Siam: collected on 23rd June, 1913.

A male from Kao Luong, 5,000 feet, in the same mountain range, differs only in having the black markings on the head a little more pronounced and in being a trifle darker beneath.

Compared with one example of *O. luciae* from N. Sarawak and seven from the Malay States (*O. vulpes*, Grant).

*Cyornis anak*, sp. nov.

Size as in *Cyornis magnirostris*, Blyth, but the bill markedly smaller: males with the breast a deeper rufous and the blackish-blue of the sides of the neck extending to restrict the rufous area of the throat to a small A shaped area falling considerably short of the mandible: upper parts deeper blue.

Females like those of *magnirostris* but the underparts paler; the abdomen more extensively white owing to lesser infuscation of the flanks, undertail-coverts white, the pale area of the throat restricted as in the males; the upper parts rather browner, less olivaceous.

Type. Adult male from Krongmun, Trang, Peninsular Siam: collected on 16th February, 1910. Specimens examined: the type, a male from Kao Luong, 2,000 feet, Nakawn Sri Tamarat, a female from Nongkok, Ghirbi and a female (? vixad.) from Chong, Trang; collected on 23rd March, 1922, 12th January, 1918 and 16th February, 1910.

Measurement: Wing ♂ 78\*, 79, ♀ 77, 72; bill from gape ♂ 19\*, 18 ♀ 17; 16.5 mm.

Compared with two males and two females of *C. magnirostris* and a large series of *C. caerulifrons* Baker—a much smaller bird. We cannot refer these examples to any known form and are very reluctantly impelled to give them a new name.

***Kittacincla malabarica interposita*, subsp. nov.**

*Kittacincla macrurus macrurus*, Robinson & Kloss, Ibis, 1919, p. 596.

Differs from *K. m. malabarica* (Scop.) of India and Burma (type locality Malabar) by its darker female and from *K. m. tricolor* (Vieill.) of the southern half of the Malay Peninsula, Sumatra and West Java (type locality) in having the feathers of the thighs in both sexes white, hardly tinged with rusty. From this new race *K. malabarica macrourus* (Gm.) of Pulau Condore, off Cochin-China, differs in being paler on the breast in males and having less black on the outer tail-feathers.

Range. From South Annam and Cochin-China to Tenasserim and down the Malay Peninsula to about Trang as far as ascertained.

Type. Adult male from Daban, South Annam: collected on 14th March, 1918, by Boden Kloss. Wing 94 mm.

Many specimens examined from the range indicated.

\* Type.



XX. ON A COLLECTION OF REPTILES AND  
BATRACHIANS FROM THE MOUNTAINS OF  
PAHANG, MALAY PENINSULA.

By MALCOLM A. SMITH, F.Z.S.

The present report is based upon collections made in two separate, but not far distant localities:—(1) from Gunong Tahan, the highest mountain of the Malay Peninsula, and (2) from Fraser's Hill, an area on the main peninsula range of considerably less altitude, north of the well-known Semangko Pass, between Selangor and Pahang, and not a part of the same range, and about 70 miles S.W. of Gunong Tahan.

The bulk of the collection is from the first-named locality, and was made by the F.M.S. Museums in connection with the meteorological survey of Gunong Tahan which has been undertaken during the past two years. I am indebted to Mr. Herbert Robinson, Director of Museums, for the privilege of examining it.

The following are the chief localities referred to:—

**Kuala Teku.** The confluence of the Tahan and Teku Rivers at the foot of the Tahan massif. Height about 550 feet above sea level.

**Kuala Tahan.** The confluence of the Tahan and Tembeling Rivers about fourteen miles below Kuala Teku. Height about 230 feet above sea level.

**Wray's camp.** A halting place about four hours walk from Kuala Teku. Height above sea level. 3,300 feet.

**Padang.** The main station on Gunong Tahan. Height above sea level about 5,400-5,700 feet.

**Gunong Gedong.** One of the peaks of the eastern Tahan range. Height above sea level about 6,400 feet.

All the specimens from Fraser's Hill were taken in June last, at an elevation of between 3,000 and 4,000 feet.

With regard to the text of the report, the numbers referred to are those of my own private register.

F.M.P., where used as a reference, indicates "Boulenger's Fauna of the Malay Peninsula, Reptilia and Batrachia, 1912."

The claim of *Rana lateralis* Boulenger, to be included in the fauna of the Peninsula, (based on a single specimen), is shown to be incorrect (see *R. miopus*).

Two new forms are described:—

*Rana cataracta*

*Kalophrynus robinsoni*.

Seven species appear new to the Peninsula:—

*Chitra indica* (Gray).

*Coluber prasinus* Blyth.

*Polyodontophis collaris* (Gray).

*Lygosoma indicum* (Gray).

*Rana miopus* Boulenger.

*Rana picturata* Boulenger.

*Kaloula baleata* (Mueller).

#### CHELONIANS.

##### *Chitra indica* (Gray).

Bouleng., Cat. Chelonians B.M., 1889, p. 264; Siebenrock, Zool. Jahrb., 1909, Suppl. 10, p. 608; Annandale, Rec. Ind. Mus., 1912, VII., p. 169, pl. VI., figs. 1 & 2.

The discovery of this species, one of the largest of the freshwater turtles, in the Malay Peninsula is a fine extension of its known range. It has previously been recorded from the Ganges and Irrawady river systems.

This turtle has also been met with in the Rathuri river, Western Siam, two adult specimens having been caught near Kanburi. These two examples, which I examined alive, differed from the description of the Indian form in that the disc was marked with numerous, pale broad lines and angular markings.

Although of not such a fierce disposition as the common *Trionyx cartilagineus*, they would when irritated suddenly shoot out their long necks with lightning-like rapidity and were capable of giving one a very severe bite.

##### *Testudo impressa* (Gunther).

*Testudo latinuchalis*, F.M.P., p. 15.

*Testudo impressa*, Malcolm Smith, Journ. N. H. S. Siam, 1922, IV., p. 204.

One adult male specimen from Fraser's Hill; length of shell in a straight line 260 mm. (No. 6591).

## SNAKES.

**Typhlops nigroalbus, D. & B.**

1 ad. from the Tembeling river.

26 scales round the body.

**Polyodontophis collaris (Gray).**

Bouleng., Cat. Sn. Brit. Mus., 1893, I., p. 184.

1 ♂ from Padang, Gunong Tahan (No. 5980).

Sc. 17 rows throughout, V. 161, C. 100. Temporals 1 + 2, 10 supralabials. Total length 473 mm., tail 72.

Dark brown above; a black vertebral line and two pale lateral ones; a black occipital bar, and another just behind on the neck. All the markings are very indistinct. White below with a series of lateral spots, confluent with the colouring of the back. Upper lip with a white streak.

Gunong Tahan is a considerable extension southwards of the known range of this species. The specimen is considerably darker in colour than any of those I have seen from further north in Siam.

**Natrix chrysargus (Schleg.).**

*Tropidonotus chrysargus* F.M.P., p. 127.

Seven examples from Kuala Teku and Kuala Tahan, 3 from Fraser's Hill. One juvenile (total length 240 mm.) is light brown in colour with black reticulations.

No.	Sex.	Ventrals.	Caudals.
5889	♂	159	80
5890	♂	159	82
5894	♂	156	88
5892	♂	164	92
6584	juv.	148	110
6586	juv.	160	106
5893	♀	146	58?
5891	juv.	156	88
6585	♀	161	30
	♂	161	89

**Macropisthodon rhodomelas (Boie).**

Kuala Tahan 2 examples, Wray's camp 1 example.

No.	Sex.	Ventrals.	Caudals.
5896	♀	143	42
5898	♂	135	53
5897	juv.	139	48



**Macropisthodon flaviceps** (D. & B.).

1 ♂ Kuala Tahan. No. 5895.

Ventrals 119. Caudals 61.

**Coluber oxycephalus** Boie.

One immature female (No. 5979) from Kuala Tahan.

Scales 25.25.17., V. 246., C. 130. Green above paler below, tail yellowish-brown, unbarred.

**Coluber prasinus** Blyth.

Cat. Sn. Brit. Mus., II., 1894, p. 59.

One ♀ (No. 5999) from Wray's camp.

Previously known from the Eastern Himalayas to Shan States (Burma), this is a considerable extension of its range of distribution. Except in the longer loreal and shorter anterior chin shields this specimen agrees entirely with the description and with an example in the Indian Museum (No. 16663) from Yunnan with which I have compared it.

Loreal nearly twice as long as deep; one praeocular, not in contact with the frontal; temporals 2 + 2; anterior chin shields a little shorter than the posterior; scales in 19 rows reducing to 13 before the vent. Ventrals 203, anal 2, caudals 105 (extreme tip of tail missing). Maxillary teeth 22; mandibular 25.

**Dendrophis pictus** (Gm.).

One ♀ Kuala Teku (No. 5975).

Scales 15.15.11. V. 160, C. 130.

Supralabials 8 and 9. The praeoculars in good contact with the frontal. Chin and throat white, rest of belly and tail below, pale bronze.

**Macrocalamus lateralis** Günth.

F.M.P., p. 153.

A single example of this rare snake from Padang, Gunong Tahan (No. 5981).

Scales in 15 rows throughout, ventrals 172. Caudals 30. A large loreal, twice as long as high; no distinct posterior chin shields.

*Colour.* Darker brownish above. A dark band from the eye to the last labial with a yellow border above; two indistinct yellow V shaped marks on the neck; labials yellow. Belly yellow spotted with black. A black line at the outer margin of the ventrals and a median subcaudal one. Total length 200 mm. Tail 30.

***Pseudorhabdium longiceps* (Cantor).**

One example from Fraser's Hill.

A common snake in the Peninsula at low levels but not usually found at any altitude.

***Calamaria pavementata* D. & B.**

F.M.P., p. 157.

One ♀ immature. Padang, Gunong Tahan.

Ventrals 164. Caudals 16.

***Psammodynastes pulverulentus* (Boie).**

Three adults. Padang, Gunong Tahan and Kuala Teku.

Scales 17.17.15., ventrals ♂ 170, ♀ 173, 174. Caudals ♂ 61, ♀ 57, 60.

This species and *Lachesis sumatrana* are the only species other than very rare on Gunong Tahan. Both are common there as on other high mountains in the Malay Peninsula.

***Doliophis intestinalis* (Luar.).**

F.M.P., p. 206.

Two examples from Kuala Tahan and Kuala Teku.

No. 5902, juv. V. 250., C. 26; No. 5903, ♀ V. 242. C. 21.

*Colour* (in spirit). Jet black above and on the sides, with 3 narrow white lines, the vertebral (not bifurcated) starting from the neck and extending to the tip of the tail, the laterals occupying the upper half of the outer row of scales and the lower half of the row next and extending to the vent. Belly with broad transverse bars of black and white; tail below orange, with two narrow bars. Top of head brown mottled black.

***Trimeresurus gramineus* (Shaw).**

*Lachesis gramineus*, F.M.P., p. 17.

Two specimens from Fraser's Hill. Green above, pale blue below; outer row of scales white in the upper half, dull red in the lower. This red pigment in the flank band is common in examples from farther north (N. Siam), but does not appear to have been recorded before from the Peninsula. It does not occur in specimens from Bangkok and the surrounding country where this snake is common.

Boulenger's statement (p. 217) that this species is without distinct canthus rostralis is not borne out in specimens I have examined. In most adults it is well marked.

**Trimeresurus sumatranus** (Raffles).

*Lachesis sumatrana*, F.M.P., p. 217.

One ♀. Kuala Teku. (No. 5978).

Scales 21.21.15. V. 186, C. 80. 7 scales between the supraoculars.

Verdant green above, with two chains of pink spots down the back coalescing on the base of the tail to form cross-bars. A pink temporal streak, and a white line down the side on the outermost row of scales. Ventrals and anterior subcaudals bright green; posterior half of tail red above, white below.

## LIZARDS.

**Gymnodactylus marmoratus** (Kuhl.).

One young ♀ from Kuala Tahan (No. 6002).

**Gonatodes kendalli** (Gray).

F.M.P., p. 38; Malcolm Smith, Journ. N. H. S. Siam, 1916, II., p. 151.

One example from Fraser's Hill.

I have already (*loc. cit. sup.*), drawn attention to the fact that a form of this Gecko exists identical in all respects with the typical one except that the male possesses 6 to 8 preanal pores in an obtuse-angled series. The present example is another instance of this form, there being 6 pores separated by an enlarged scale.

**Draco fimbriatus** Kuhl.

One ♂ from Wray's camp, (No. 5983).

**Draco melanopogon** Bouleng.

Two ♂ from Kuala Tahan.

**Draco volans** Linn.

One ♀ from Kuala Tahan.

**Draco formosus** Bouleng.

F.M.P., p. 61.

One ad. ♂, 1 ad. ♀, Kuala Teku Nos. 5984, 5907.

The female specimen confirms what I have previously stated (Journ. N. H. S. Siam, II., p. 153) that the throat is maroon or crimson, not green as given by authors.

**Gonyocephalus borneensis** (Schleg.).

1 ad. ♂, No. 5906. The gular sac in this specimen is unusually small.



***Gonyocephalus robinsoni* Bouleng.**

Journ. F.M.S. Mus. III., 1908, p. 65, pl. V.; idem. F.M.P., p. 67, fig. 19.

One ♀ ad. and 1 juv. from Padang, Gunong Tahan.

Previously known from 1 ad. ♂ and 1 young one. The adult agrees well with Boulenger's description. The gular pouch is fully as large as in the male. There are a few unevenly disposed enlarged scales upon the flanks. 9 upper and 9 lower labials; 72 scales round the middle of the body, the laterals not much smaller than the dorsals. The third and fourth fingers are of equal length.

Head and body, 125 mm., tail 300.

The juv. (No. 5990) has a head and body of 46 mm., and a tail of 105. Gular pouch well developed. 8 upper and 8 lower labials. About 80 scales round the body with enlarged ones as in the adult.

***Calotes floweri* Bouleng.**

F.M.P., p. 70.

One juv. from Gunong Gedong, No. 5905.

Fifty-seven scales round the middle of the body. Greyish brown above, without dark patches.

This form has not yet been found below 6,000 feet in the Malay Peninsula.

***Calotes cristatellus* (Kuhl.).**

F.M.P., p. 70.

Kuala Tahan, 2 ad. ♀., Nos. 5904, 5988.

Green with a large chocolate patch on either flank; the hind limb reaches the eye; 80 and 85 scales round the middle of the body. Boulenger's statement that this species has up to 120 scales round the middle of the body needs I think confirmation. I have never yet seen any examples with more than 100, although I have examined numerous specimens from all parts of the Malay Peninsula and Archipelago.

***Varanus dumerilii* (S. Müll.).**

F.M.P., p. 77.

Kuala Teku, 1 ex. (No. 5908).

A very young specimen which I refer to this species.

***Mabuia multifasciata* (Kuhl.).**

Seven specimens from Kuala Tahan and Kuala Teku.

Thirty-four scales round the body in five, 32 in two; dorsals tricarinate in all. The hind limb reaches the axilla in two.

**Lygosama indicum** (Gray).

Bouleng., Fauna Brit. Ind., Rept., p. 195.

Two young examples from Fraser's Hill.

As was expected, this lizard with its wide range from the Eastern Himalayas to Southern China, Burma, Siam and Indo-China has now been found also in the Malay Peninsula.

**Lygosoma butleri** Bouleng.

F.M.P., p. 91.

One example from Fraser's Hill (No. 6590). Hitherto recorded only from the Larut Hills, Perak.

Distance between the end of the snout and fore-limb less than  $1\frac{1}{3}$  times in distance between axil and groin. 10 and 11 subdigital lamellae beneath the fourth toe.

Brown above and on the sides, thickly spotted with yellow. No dark lateral band. Below yellowish. From snout to vent 29 mm., tail 42.

**Lygosoma olivaceum** (Gray).

Two examples from Kuala Tahan.

Thirty scales round the body, dorsals tricarinate.

**Lygosoma vittigerum** Bouleng.

F.M.P., p. 94, Malcolm Smith, Journ. N. H. S. Siam, 1922, IV., p. 208.

One example from Kuala Teku (No. 5909).

It has 30 scales round the body and with the other specimen from Kuala Teku recorded by Boulenger has the praefrontals in broad contact with each other. These two specimens and one other from Ginting Bidai appear to be the only records of this species in the Malay Peninsula.

**Lygosoma cophias** Bouleng.

Journ. Fed. Mal. States Mus. III., p. 67, Pl. IV., Fig. 3; F.M.P., p. 96.

One spec. from Wray's camp. (No. 5910).

Known from a single specimen previously obtained on Gunong Tahan. This second example differs from the type description in the following particulars:—Distance between end of snout and fore-limb  $1\frac{2}{3}$  times in distance between axil and groin. A pair of distinctly enlarged praecaudals. 10 lamellae beneath the fourth toe.

Head and body 35 mm., tail 48; arm 6; leg 9.

*Lygosoma larutense* Bouleng.

F.M.P., p. 97.

One specimen Padang, Gunong Tahan.

Previously known only from the Larut Hills, Perak. The specimen has 28 scales round the middle of the body. There are 6 and 7 supralabials, the fourth (or fifth) which is subocular being wedge-shaped, its apex not quite reaching the margin of the lip.

Total length 205, head and body 90; fore-limb 7; hind limb 10; from snout to fore-limb 20; fore-limb to hind limb 66 mm.

Dark grey on the back and sides, yellowish-white below. Neck with 3 narrow transverse, yellowish bars, back with 6 fine longitudinal lines.

## BATRACHIANS.

*Oxyglossus laevis* Günth.

F.M.P., p. 225.

Seven examples from Kuala Tahan (Nos. 6045-6049) Largest 32 mm. from snout to vent.

I have recently also examined a large series of this frog from Mount Dulit, Borneo. The Gunong Tahan specimens agree well with the Bornean individuals, and differ from Siamese examples in the larger size of the discs of the toes and in having the belly always unspotted.

*Rana laticeps* Bouleng.

F.M.P., p. 230.

Three examples from Wray's camp and the Tahan river.

Very common on Fraser's Hill whence a large series was obtained.

Apparently known in the Peninsula previously, with certainty, only from Gunong Kledang, Perak.

The tibio-tarsal articulation may reach the tip of the snout.

*Colour.* Light or dark greyish with dark grey markings. The **A** shaped mark on the back is present in most juveniles, often enclosing a dull orange patch in life, but indistinct or absent in the adults. Below white, the throat and limbs with small black spots. A thin pale vertebral line sometimes present.

*Rana doriae* Bouleng.

Rec. Ind. Mus., 1920, XX, p. 49; F.M.P., p. 231; Malcolm Smith, Journ. N.H.S. Siam, 1922, IV, p. 217.

One female (No. 5922) from Kuala Teku,



Predominating colour above reddish-brown, with small black markings ; throat and chest handsomely mottled with brown.

***Rana plicatella* Stoliczka.**

Bouleng., Rec., Ind. Mus., 1920, XX, p. 53 ; Malcolm Smith, Journ. N.H.S. Siam, 1922, IV, p. 227.

Three adult males, Fraser's Hill. I have recently dealt very fully with these specimens and the place of this frog in the *R. doriae* group (*loc. cit. sup.*).

***Rana macrodon* D. & B.**

Rec. Ind. Mus., 1920, XX, p. 40.

Three half-grown examples from Kuala Tahan ; two adults and 1 half grown from Fraser's Hill.

I place these specimens under Boulenger's var. *blythii*, a dubious race as its characters do not coincide with any definite geographical distribution. In the younger specimens the tibio-tarsal articulation usually reaches to beyond the tip of the snout, in the adults to not quite so far.

***Rana glandulosa* Bouleng.**

Rec. Ind. Mus., 1920, XX, p. 181.

Two examples from Fraser's Hill.

***Rana picturata* Bouleng.**

Rec. Ind. Mus., 1920, XX, p. 179.

Seven examples from Kuala Teku and Kuala Tahan (Nos. 5913-5915 and 6028-6031). The species has hitherto been found only in Borneo. The largest, a male, is 57 mm. from snout to vent ; the largest female is 55 mm. Two females taken at the end of November are full of ripe ova.

*Colouration.* Black above, handsomely spotted and marked with yellow or yellowish-brown. Five of the specimens have a yellow band starting from the tip of the nose and passing along the canthus rostralis, the margin of the eyelid and down the back on either side to the groin. Lower parts brown, with small white spots in four examples, whitish, uniform in two, whitish with black spots in one.

Two of the specimens, both ♂, have large irregular flat glands on the back.

This species closely resembles *R. glandulosa* to which I at first referred them, but it can be recognized by the more extensive web to the toes, and the more ornate colouration. The male also has internal vocal vesicles.

***Rana luctuosa* (Peters).**

F.M.P., p. 238.

Fourteen examples from Fraser's Hill.

***Rana miopus* Bouleng.**

*Rana miopus* Bouleng., Journ. N.H.Soc. Siam, 1918, III, p. 11 ;  
idem, Rec. Ind. Mus., 1920, XX, p. 149.

*Rana lateralis*, Laidlaw, P.Z.S., 1900, p. 886, pl. LVII, figs. 1 & 2 ;  
Bouleng. (in part) F.M.P., 1912, p. 239.

Two adult males (Nos. 5911 & 5912) from Kuala Tembeling, and 1 juvenile (No. 6037) from Kuala Tahan.

Originally discovered in the mountains of Nakon Sritamarat, Peninsular Siam, this frog was described from an adult female specimen and a juvenile. A male taken at the same time, and until recently in my possession,\* agrees well with these individuals from Gunong Tahan. They have the curious blackish, obliquely-running fine glandular folds across the back which are to be found only in one other species of frog from this region, namely *R. lateralis*. It turns out also that the frog recorded and figured by Laidlaw from Kuala Aring, Kelantan (P.Z.S., 1900) as this latter species, must be referred to *miopus*. Miss Procter has kindly examined this specimen, now in the Museum at Cambridge for me, and confirms my suspicions as to its identity.

In the three males examined by me the canthus rostralis is distinct ; the hind limb reaches to between the nostril and the eye ; the skin of the back is smooth in one and more or less studded with minute horny tubercles in two.

The vocal sacs are very prominent, appearing as distended pouches through a slit on either side of the throat in front of the fore-arm. They have a large flat oval gland at the shoulder and a thick pad on the inner side of the first finger.

*Colour.* Greyish-brown above and on the side, the glandular dorsal fold not darker ; a dark brown patch enclosing the tympanum ; upper lip lightish ; the limbs with dark bars ; a series of fine black lines running obliquely downwards from left to right between the dorso-lateral folds. Below yellowish-white.

The juvenile from Gunong Tahan is coloured pink, like the juvenile from the type locality.

As the Kuala Aring specimen is the only record of *Rana lateralis* in the Malay Peninsula, it must disappear from the fauna of this region.

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\* Now in the British Museum of Natural History.

MEASUREMENTS OF *R. miopus*, in mm.

No.	-	-	1210	5911	5912
Snout to vent	-	-	65	62	63
Length of head	-	-	23	21	23
Breadth of head	-	-	22	21	22
Snout	-	-	9	9.5	10
Eye	-	-	7	6.5	7
Interorbital width	-	-	4.5	5	5
Tympanum	-	-	5	5	5.5
Arm	-	-	39	40	41
1st finger	-	-	11	10.5	10
2nd „	-	-	8	9	8
3rd „	-	-	11	11	11
4th „	-	-	7.5	8	7.5
Hind limb	-	-	100	100	103
Tibia	-	-	32	33	32
Foot	-	-	31	32	32
			Khao Wang Hip (P. Siam).		G. Tahan.

*Rana nigrovittata* (Blyth).

Bouleng., Rec. Ind. Mus., 1920, XX, p. 144 ; idem. F.M.P., p. 242 ;  
Malcolm Smith, P.Z.S., 1921, p. 433 ; idem., Journ. N.H.S. Siam,  
1922, IV, p. 212.

One example from Kuala Teku (No. 5927).

Boulenger has included this species in the fauna of the Peninsula on the strength of young specimens from the Batu Caves, Selangor. An adult ♀ obtained at Kuala Teku, confirms his opinion.

Colouration. Brown above, with a broad well defined black stripe along the upper half of the flank.

*Rana chalconota* Schlager.

*Rana labialis*, F.M.P., p. 242.

*Rana chalconota*, Bouleng., Rec. Ind. Mus., 1920, XX, p. 201.

Two examples from Kuala Teku.

*Rana hosii* Bouleng.

F.M.P., p. 243.

One adult ♂ from the Tahan river. (No. 6036).

The tibia is exactly the length of the head and body, and the tibio-tarsal articulation reaches well beyond the snout.



*Rana cataracta*, *sp. nov.*

Type adult male, Author's No. 6164, collected on Khao Ram, Nakon Sritamarat Hills, Peninsular Siam, at 300 metres elevation, in Feb. 1922.

*Description of type.* Vomerine teeth in moderately strong, oblique series, commencing between the choanae and extending beyond their posterior borders, equidistant from each other and from the choanae. Head a little longer than broad, much depressed; snout obtusely pointed, projecting a little beyond the mouth. Canthus rostralis strong, slightly oblique, deeply concave; nostril nearer the end of the snout than the eye; distance between the nostrils greater than the interorbital width, which is less than that of the upper eyelid; eye large and prominent, its diameter nearly equal to the length of the snout; tympanum very distinct,  $\frac{3}{5}$  the diameter of the eye, not half as long as its distance from the latter.

Fingers moderately long, the tips dilated into large discs, those of the third and fourth considerably smaller than the tympanum; first finger slightly shorter than second, third longer than the snout; subarticular tubercles large and prominent.

Hind limb long, the tibio-tarsal articulation reaching well beyond the tip of the snout; heels strongly overlapping when the limbs are folded at right angles to the body; tibia once and three-fifths in length of head and body, longer than the foot; a feeble tarsal fold; toes with discs similar to but smaller than those of the fingers, fully webbed, the web involving the bases of the discs, slightly emarginate; outer metatarsals separated to the base; subarticular tubercles moderately large, prominent; inner metatarsal tubercle oval, somewhat flattened, one-third the length of the inner toe; no outer tubercle.

Upper parts finely granulate; coarsely granulate behind the thighs and upon the sides of the body, the latter also with numerous small warts; lower parts smooth. A moderately broad and fairly prominent glandular dorso-lateral fold from the eye to the hip.

*Colour.* Verdant green in life above, greyish in spirits; sides of the head and body a little darker; limbs with indistinct cross bars; upper lip and the glandule behind it, white. Lower parts white.

Vocal vesicles internal; a moderately strong pad on the first finger. No other sexual characters.

*Variation.* 21 specimens examined, 11 ♂ 3 ♀, from the type locality, 4 ♂ 3 ♀ from Fraser's Hill. Except

for some slight differences in measurements, the males do not differ in any important character from the type specimen except in having a more prominent, glandular dorso-lateral fold. Females are considerably larger.

Two of the males (Nos. 6532, 6534) from Fraser's Hill are coloured as follows :—Bright green on the back, sides of body and limbs above brown, the latter with darkish crossbars ; below white. Two females from the same locality (Nos. 6535-6) are purplish brown above and on the sides ; below whitish, the throat, chest and under surface of limbs heavily powdered with brown.

Eggs large and unpigmented, 2.5 mm. in diameter.

*Rana cataracta* is closely allied to *R. hosii* Blgr., and *R. livida* (Blyth).<sup>\*</sup> From the former it differs in the larger tympanum, more coarsely granulate skin, and very distinctly in colouration. From the male of *R. livida*, with its prominent bladder-like external vocal vesicles, it is easily distinguished. The females of the two, except for some slight differences in colouration appear to be indistinguishable from each other.

From *R. chalconata* (Schleg.) another near ally which agrees exactly with it in colouration, and which was found in company with it on Khao Ram, it differs in the longer hind limb, more fully webbed toes and in the absence of the small external metatarsal tubercle.

*Remarks.* This new frog was first discovered on Khao Ram, on the banks of a stream famous for its series of magnificent waterfalls. It was common at 300 metres altitude, at a couple of large pools where we were camped for some days, but was not found on two other hills in the same range visited on the same trip.

Its habits were those of a true tree frog, perching high up in bushes, or on the trunks of trees, or hopping about on the rocks beside the swiftly flowing water. The call of the male, heard at night only, was a short whistling cry, sometimes almost a scream, and by it they could be tracked down with a lantern and caught.

The *Rana livida* obtained by Wray in the Larut Hills, Perak, should possibly be referred to this species.

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<sup>\*</sup> Also to *R. graminea*, Blgr., which appears to differ from *livida* chiefly in the presence of a more or less defined glandular dorso-lateral fold. Originally described from Hainan, this frog has since been found to be widely spread over Siam and Indo-China. I strongly suspect the two will have to be united.

MEASUREMENTS OF *R. cataracta*, FROM KHAO RAM, in mm.*Type.*

No.	-	6169	6160	6163	6162	6164	6165	6166	6170	6186	6187
Snout to vent	-	50	53	54	57	53	55	51	50	86	86
Length of head	-	18	20	20	20	18	21	19	18	29	29
Breadth of head	-	16	17	17	18	16	19	17	16	29	27
Snout -	-	8	8	8.5	8.5	8	9	7.5	7	13	13.5
Eye -	-	6	8	7	7	7.5	8	7.5	7.5	10	10
Interorbital	-	4	4.5	4.5	5	4	5	4	4.5	7.5	8
Tympanum	-	4	4.5	4.5	4	4	4.5	4	4.5	4.5	4.5
Fore limb	-	31	37	35	38	35	37	34	32	57	55
Hind limb	-	92	98	99	110	98	35	97	91	148	150
Tibia -	-	32	32	35	37	34	34	32	32	52	53
Foot -	-	27	29	28	31	29	31	28	28	48	46
Sex -	-	♂	♂	♂	♂	♂	♂	♂	♂	♀	♀

## MEASUREMENTS OF SPECIMENS FROM FRASER'S HILL.

No.	-	-	6531	6532	6533	6534	6535	6536	6600
Snout to vent	-	-	49	50	48	46	95	98	104
Length of head	-	-	19	19	18	16	32	34	35
Breadth of head	-	-	16	16	16	14	31	31	34
Snout -	-	-	8	8	7.5	7	14	16	17
Eye -	-	-	7	6.5	7	5.5	11	10.5	12
Interorbital width	-	-	4	4	4.5	4	9.5	9	10
Tympanum	-	-	4	4	4	3.5	6	6.5	5.5
Fore limb	-	-	30	33	30	30	64	67	69
Hind limb	-	-	89	86	90	89	180	186	198
Tibia -	-	-	30	32	30	32	62	67	70
Foot -	-	-	25	27	26	27	52	56	61
Sex -	-	-	♂	♂	♂	♂	♀	♀	♀

*Type to the British Museum of Natural History.****Rana larutensis* Bouleng.***Rana larutensis*, F.M.P., p. 245.*Staurois larutensis*, Bouleng., Ann. Mag. Nat. Hist. (9) 1, 1918, p. 374.

Six examples, Padang, Gunong Tahan and Kuala Teku ; four examples, Fraser's Hill

The largest ♀ is 75 mm., from snout to vent, the largest ♂ 44 mm. Another ♀, 70 mm. in length, taken in December, contained about 800 eggs, unpigmented, each measuring from 1.75 to 2 mm. in diameter. Several tadpoles with fully developed limbs and diminishing tail, but with the large ventral sucker still complete were taken at the same time.



The amount of black blotching upon the upper parts of the frog is variable, and may be so extensive as almost to obscure the green. Some specimens have the throat and under surfaces of the thighs heavily marked with black also.

The male has vocal vesicles fairly well marked externally, the skin on either side of the jaw being thinned and thrown into longitudinal folds.

**Rhacophorus leucomystax** (Gravenh.).

F.M.P., p. 248.

Three examples from Kuala Tahan and many from Fraser's Hill. In some of these the tibio-tarsal articulation reaches the tip of the snout, in others well beyond. The hind leg of this common tree-frog varies greatly in length, and in the large series in my possession from Siam and Indo-China, the tibio-tarsal articulation reaches beyond the snout in more than half of them. Philippine examples evidently do the same (cf. Taylor, Philippine Amphibia, 1920, p. 289).

**Rhacophorus bimaculatus** Bouleng.

F.M.P., p. 250.

13 exs. Bukit Fraser.

This tree-frog is very closely allied to *R. reinwardti* Boie, and I doubt if it should really be considered specifically distinct. I have compared the above examples, and 24 more from Khao Luang in the Nakon Sritamarat Hills, Peninsular Siam (unfortunately, only one more than half grown) with 4 specimens of typical *reinwardti* from Java. None of the differences claimed by Boulenger for them will stand.

The vomerine teeth may be in slightly oblique series or perfectly straight. The cutaneous folds above the vent along the sides of the arms and legs may be slightly or strongly developed. No black spots are present on the membrane between the fingers and toes of the Siamese examples, but are present in half the series from the Malay Peninsula.

The character in which the two forms however do consistently differ is in the size of the discs of, and extent of the web between, the fingers and toes. In *reinwardti* the finger discs are always larger than the tympanum and the membrane is fuller, usually extending to the disc of the third finger. In *bimaculatus* the discs are not larger, and often smaller, than the tympanum, and the web never reaches the disc of the third finger.

In addition the membrane of both fingers and toes in *reinwardti* are wider, allowing a more complete separation of the digits. Thus when the fingers of this frog are fully extended, the first and fourth form a straight

line; in *bimaculatus* they make an obtuse angle. The external metatarsals are completely separated in *reinwardti*, in *bimaculatus* not completely.

Tadpoles taken on Fraser's Hill and bred out by me agree entirely with van Kampen's description of the tadpole of *reinwardti* (Nat. Tijds. Ned. Ind., LXIX., 1909, p. 43).

The colouration of *R. bimaculatus* in life shews considerable variation, the upper parts ranging through various shades of green, grey, pink or brown, usually uniform but sometimes with an indistinct dark (upon the back. Below dull yellow the membrane between the fingers yellow, between the toes red or orange, this colour sometimes including the upper arm, flanks and a band along the thighs. Very young specimens are light brownish-green above, with a white throat and belly and yellow limbs.

*R. reinwardti* appears to have accommodated itself to more lowland conditions, thriving at Buitenzorg, altitude 250 m., while *R. bimaculatus* as far as the Malay Peninsula and Siam is concerned has not been found below 700 m.

#### *Philautus brevipes* (Bouleng.).

*Ixalus brevipes*, Bouleng, Journ. F.M.S. Mus. III., 1908, p. 63, pl. IV., fig. 1; F.M.P., p. 253.

A fine series of 16 specimens of this little tree-frog, hitherto known only from a single example. (Nos. 5970 and 6007 to 6021). One was taken by Mr. Chasen at Kuala Teku on a broad leaf overhanging the water, the remainder are from Camp Padang. The type was obtained by Mr. Robinson on Gunong Tahan at 1,000 metres.

The series agrees well with the description. The tibio-tarsal articulation may reach to the anterior border of the eye. The tympanum varies in distinctness, and is always smaller than the disc of the third finger. The skin of the back is smooth in some, finely shagreened in others.

As is common with many species of *Philautus* the colour is variable. About half the series shew the dark patch on the back, more or less as figured in the description of the type. In others the back is uniformly but coarsely speckled with black all over. Some have no dark bars to the limbs. Greyish olive is the predominating colour above, except in one example which is reddish brown.

The example from Kuala Teku (No. 5970) is pale grey above (under the glass dark grey finely vermiculated with buff), and with a broad irregular buff band along either side of the back. This specimen, the largest, measures 36 mm. from snout to vent.

Several of the females contain ripe ova, the eggs being large, few and pigmented. Diameter 2 mm.



***Philautus castanomerus* (Bouleng.).**

*Ixalus castanomerus*, Bouleng., Journ. F.M.S. Mus., I., 1905, p. 39, pl. IV., fig. 1; F.M.P., p. 254.

One example, Kuala Teku (No. 5929) ; one example Wray's Camp (No. 5930).

Boulenger's description, drawn up from a single example, agrees entirely with these two specimens except in colouration, a point of little significance with many of the members of this genus, so greatly may they vary both in colouration and in markings.

No. 5930 has the snout obliquely pointed as in the figure, the other, a larger one, has it more acutely pointed owing to the presence of a distinct dermal tip.

Both specimens are dark brown colour above, the smaller one uniform, the larger with indistinct paler mottlings and indications of a dark X ; below pale yellowish-brown, heavily spotted with dark brown.

Boulenger has compared this species with his *P. vermiculatus* ; I can find nothing, however, except colouration and a slightly narrower interorbital region, to separate it from the Javan *P. aurifasciatus* Schlegel, with a specimen of which I have compared it.

***Kalophrynus robinsoni*, sp. nov.**

Type, author's number 5935, collected at Wray's Camp in Oct. 1920 ; presented to the British Museum.

*Description of the type.* Tongue elliptic, entire. Snout short, truncate, projecting slightly beyond the mouth ; canthus rostralis distinct, loreal region vertical, feebly concave ; interorbital region broader than the upper eyelid ; tympanum distinct, two-thirds the diameter of the eye. First and second fingers very short, not half the length of the third, fourth shorter still ; toes one-third webbed, the web extending as a fringe along the outer sides of the toes ; fifth toe shorter than the third ; tips of fingers and toes bluntly pointed ; a feebly developed oval inner metatarsal tubercle and a rounded outer one. The tibiotarsal articulation reaches the tympanum.

Skin of the back granular, with small scattered tubercles ; a series of tubercles along the dorso-lateral region from the eye to the groin ; belly and groin with large, coarse granules ; throat with finer granules ; a curved fold from the eye to the shoulder.

Light brown above with dark brown markings, in particular a large one on the back extending forwards in two branches to the eyelids, and backwards, in two longer branches to the groins ; sides of head and body very dark brown, this colour sharply defined from the light brown



of the back ; limbs with dark cross bars, and a dark patch enclosing the vent and extending along the back of the thighs. Below yellowish, spotted and speckled with brown.

From snout to vent 17 mm.

*Variation.* Five examples from the type locality (author's numbers 5934 to 5938 inclusive) and one more from Kuala Teku (5942) do not show much variation from the type specimen. The tympanum is not so distinct in two examples ; in one the series of tubercles along the doso-lateral region is very conspicuous, and there is in addition another series along the hinder side of each thigh as in *K. pleurostigma*. Two specimens have a pink tinge upon the upper parts ; the dark forked mark on the back varies considerably both in extent and shape.

*Kalophrynus robinsoni* is related to *K. heterochirus* Boulenger, from Borneo, from which it differs in the shorter hind limb, shorter third finger, the strongly tubercular skin and distinctive colouration.<sup>1</sup>

The specimens here described are evidently very young. Their characters however are quite distinct. The dermal ridge across the palate behind the choanae is obtusely V shaped and interrupted in the mid-line, as in *K. pleurostigma* ; the ridge in front of the oesophagus is pronounced and strongly denticulate, while the one anterior to it is curved and less strongly denticulate. Boulenger's figure of *K. pleurostigma* in F.M.P., 257, represents the anterior ridge as a continuous curve. In 22 specimens in my collection from various parts of Siam and Indo-China, it is in each one interrupted in the mid-line for some distance. Miss Procter informs me that the palatal ridge of *K. heterochirus* is almost straight, and is just interrupted in the middle.

***Microhyla butleri* Bouleng.**

F.M.P., p. 261.

One juvenile from Kuala Teku ; four adults from Fraser's Hill.

Recently also I have examined a specimen from the He-Ho plain, Southern Shan States, Burma, sent me by Dr. Anandale ; a considerable extension of the known geographical range of this frog.

***Microhyla berdmorei* (Blyth).**

F.M.P., p., 263.

Two juveniles, one from Kuala Teku, the other of unknown origin—the label being lost. It is certainly however from somewhere on this mountain.

This specimen a ♀ (No. 6050) is somewhat remarkable, in that although only 17 mm. in length from snout to vent

1. Kindly compared for me by Miss Procter with the type specimen, now in the British Museum.

it is filled with ripe ova. In every character however it agrees with *M. berdmorei*.

**Kaloula baleata** (Müller).

*Callula baleata*, Bouleng., Cat. Batr. Sal., 1882, p. 169.

*Kaloula baleata*, Barbour, Mem. Mus. Comp. Zool. (1912), XLIV, (1) p. 72.

One adult ♀ (No. 5928) with ripe ova collected at Kuala Tahan, in January. This is the first record of this burrowing frog from the mainland of Asia, although it is well known in the Archipelago.

**Phrynella pulchra** Bouleng.

F.M.P., p. 265.

A male and female taken in copula in September at Kuala Tahan (Nos. 5931, 5932). They were caught in the bottom of a boat in a pool of water that had collected there from a storm of the previous night. Eggs large and pigmented, the vitelline sphere measures 1.5 mm. in diameter. The male has the pad at the base of the first finger slightly larger than that of the female, but there are no other characters separating the sexes.

**Bufo jerboa** Bouleng.

F.M.P., p. 271.

One half-grown example of this toad from Kuala Teku.

**Bufo penangensis** Stol.

F.M.P., p. 270.

One example Kuala Teku. Two examples Fraser's Hill.

The Bukit Fraser examples have dull white markings instead of the usual yellow ones.

**Bufo parvus** Bouleng.

Two examples Kuala Tahan.

**Bufo asper** Gravenh.

Apparently common in most localities up to 1,500 metres.

**Megalophrys nasuta** Cantor.

One example Wray's camp. No. 4947.

**Megalophrys longipes** Bouleng.

Bouleng. P.Z.S., 1908, p. 415.

One-half grown example from Fraser's Hill.

[*Rana pullus* Smith (antea p. 197) is preoccupied by *Rana pullus* Stoliczka (Journ. Asiat. Soc. Bengal XXXIX 1870, p. 142) and the frog from Chumporn may therefore be known as *Rana tasanæ* (cf. Journ. Nat. Hist. Soc. Siam, VI, 1921, p. 193)].

XXI. A BUTTERFLY NEW TO THE MALAY  
PENINSULA.

By H. M. PENDLEBURY, F.E.S.

*Systematic Entomologist, F.M.S. Museums.*

Amongst some insects recently obtained in the Main Range north of Gunong Berumbun is a butterfly of a species not yet recorded from further south than Tenasserim :—

FAMILY NYMPHALIDAE.

Sub-family Satyrinae.

*Lethe verma* Koll.

*Lethe verma* Fruhst. in Seitz' *Macrolepidoptera*, IX, p. 324;  
Bingham, *Fauna of British India, Butterflies I.*, p. 84.

♂, Lubok Tamang, Pahang, F.M.S., 4,000 feet, Sept.  
8th 1922. Native Collector.

This individual which has an expanse of 68 mm., the prominent ochreous-white oblique discal band on the forewings beings 7 mm. broad in the middle, comes nearest to the wet-season form *L. V. sintica* which, according to Fruhstorfer "... presents very definitely the aspect associated with a rainy district ; compared with *verma* from the dry West of the region." *L. v. stenopa* Fruhst., recorded from Tenasserim, "... shows a reversion towards *verma* ; comes likewise from districts with a small rainfall and hence again with predominantly dry-season facies."

Previously recorded from N.-W. and E. Himalayas ;  
Assam ; Khasia Hills ; Burma and Tenasserim.

Fruhstorfer, l.c., places this species under group  
*Hermias*, Fruhst. and records six subspecies as follows:—

*L. v. verma* Koll. Common in Kashmir and  
Mussurie.

*L. v. sintica* Fruhst. Sikkim and Assam.

*L. v. stenopa* Fruhst. Tonking, Hainan, Shan States  
and Tenasserim.

*L. v. laticincta* Fruhst. Wet season form, China.

*L. v. cinctomani* Fruhst. Melanotic island extreme,  
Formosa.

*L. v. satarnus* Fruhst. Mountain form, Omeishan,  
W. China.





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